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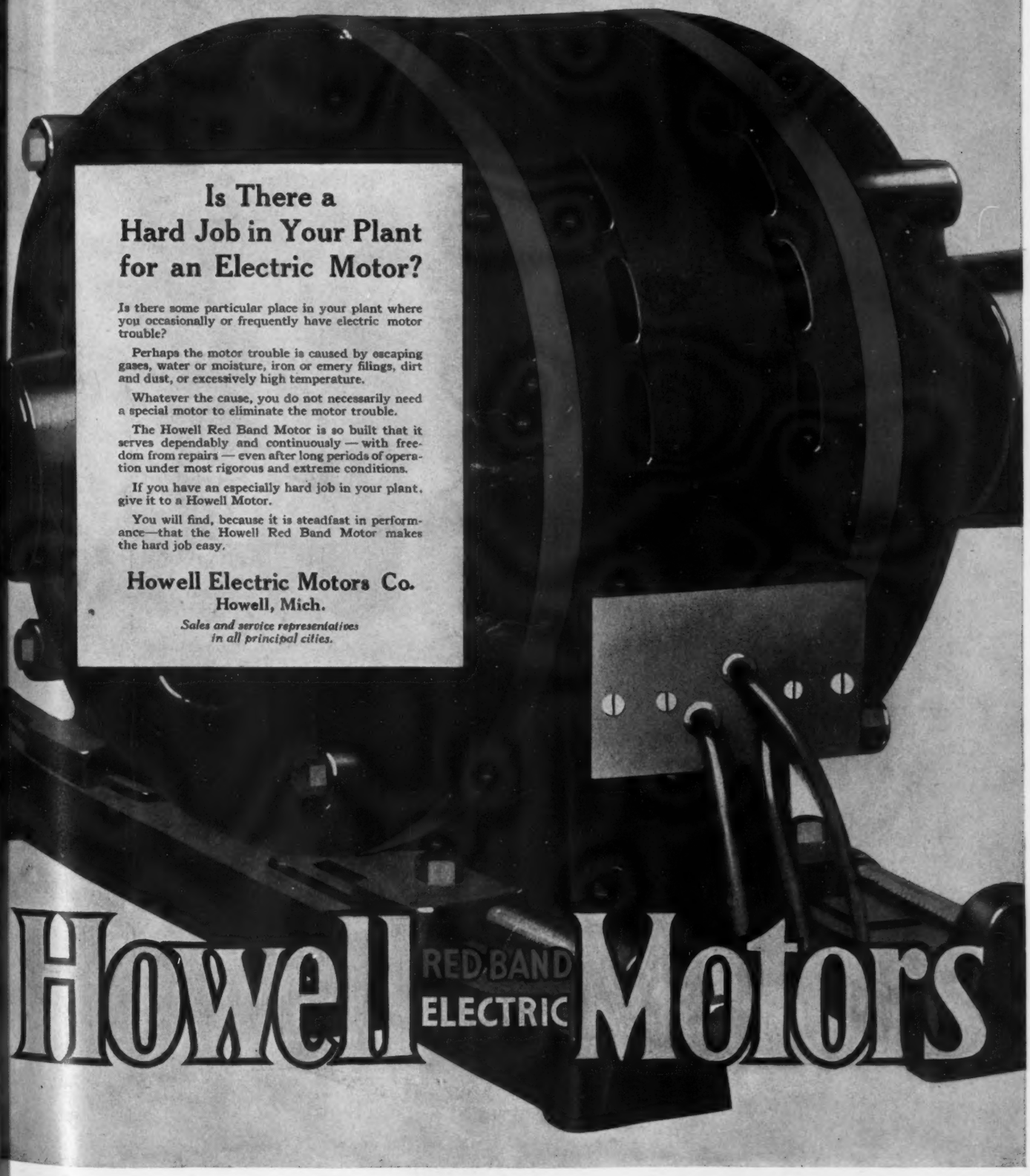
Electrical World

McGraw-Hill Company, Inc. New York, November 19, 1921 Twenty-five Cents a Copy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Electrical World

New York, Saturday, November 19, 1921

What the World Wants from the Washington Conference

IN our capital this week the great nations have gathered in a conference in the hope that some way can be found to limit armaments. They want to lessen the tax burden on all peoples and to put an end to war.

A few years back many millions of the young men of France, Great Britain, Italy and America gave up their lives in bitter agony. But it was not to win the world war that they marched out and died. It was to stop the war and to win back peace. And the war was stopped. But the peace has not been won. And peace cannot return again while governments with evil ingenuity continue adding to their armaments—which threaten war—and piling up more wasteful debts for war-stricken humanity to pay.

Think! Of all the money that is poured into the national treasury in Washington 93 per cent is spent for navies, armies and the cost of former wars. And in France and England it is worse. The pity and the folly of it that men and women should persistently pursue a course so imbecile! How can we and why should we carry such a load?

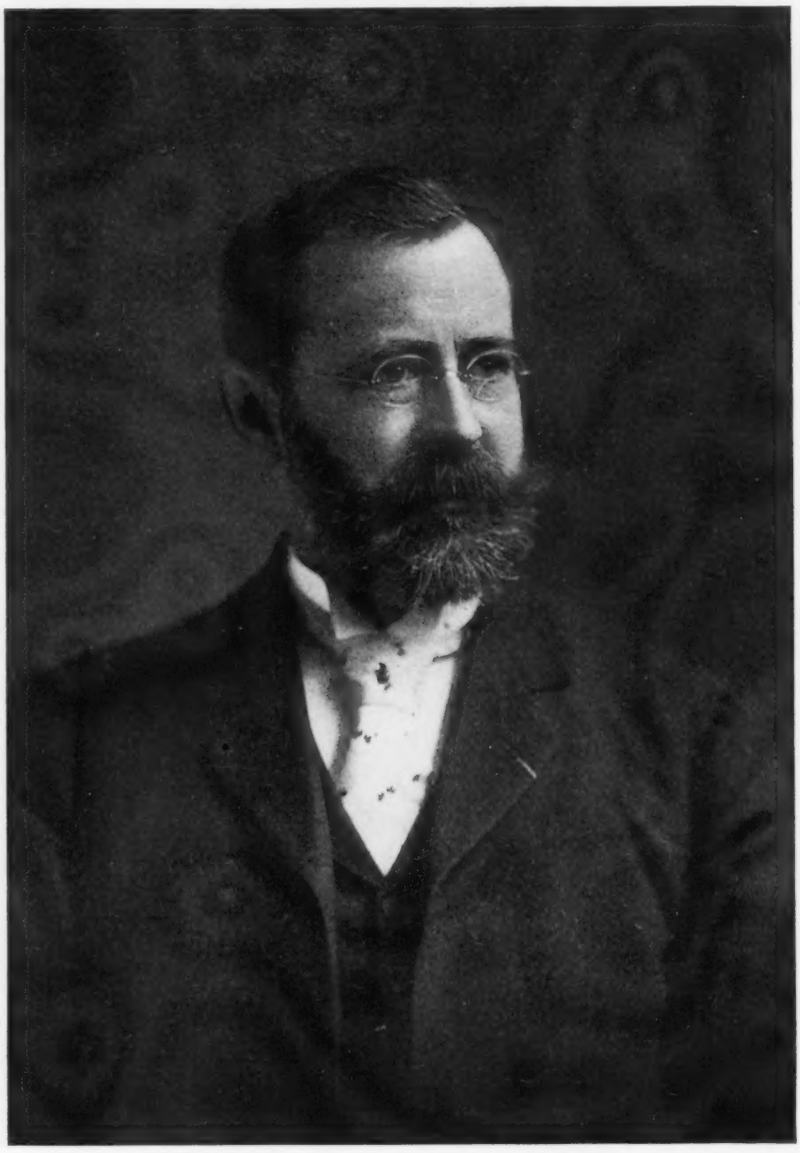
Lloyd George, in his Guildhall speech, said that around the entire horizon of the world's affairs today the only bright spot of hope comes from the Washington conference. For economically the world lies paralyzed. The human mind fails to grasp the complexity of the situation. Its all-shadowing menace we do not half see. Yet it is not a theory but a condition of impending peril to all, and something must be done and done at once and done by the people.

There is but one way out—one road to economic health and safety. The world must work. We cannot talk ourselves into prosperity. We cannot argue ourselves into stability. Work alone can save the world—intelligent work—untiring work—work in its most homely sense. And this work must be done not by nations, but by individuals—avoiding the duplication and wastefulness of competition and employing to the full the progressive and constructive power of co-operation—individually, industrially and internationally.

The leaders of the world have come to Washington because upon this conference rests the only hope. We must win back our peace through work. But it must be unthreatened peace of the heart and peace of the mind, and it must be permanent. Therefore the people call upon these men in Washington to see to it *right now* that the fruits of this saving labor be not hereafter perpetually jeopardized and almost entirely wasted in taxation for war. Our lives and treasure must be made secure and safe now. That is what the whole world wants.

Carl Hering

Engineer and scientist who has contributed in a large degree to the development of the science of electrometallurgy.



ONE of the oldest and yet one of the newest phases of the science of electricity is electrochemistry. In the battery the electric current was discovered. In the production of intense heats for metallurgical processes lies one of the fairly recent applications of electricity—one which is growing by leaps and bounds. In both of these fields, but more especially the latter, the name of **Carl Hering is justly prominent.** Since 1886 he has been practicing in Philadelphia as a consulting electrical engineer. A man of many attainments and international reputation, he has all his life been an enthusiastic searcher for a scientific explanation of apparent exceptions to generally accepted physical laws, and as an outcome of this trait he has been a stickler for the correct expression of scientific results in standard units and has contributed considerably to the construction and classification of electrical nomenclature.

Dr. Hering's work in electrochemistry began with extended researches with storage batteries prior to 1890, as a result of which he obtained numerous patents. He also investigated the commercial regeneration of spent battery solutions. His electric furnace work dates back to some tests in 1900 for the reduction of arsenic ore. Some six years later, while designing and operating electric furnaces, he began a series of experiments which resulted in the announcement of the discovery of a new internal electromagnetic force tending to contract a conductor through which current is flowing even to the extent of rupture when it is a fluid, and which is now known as the "pinch" effect. He later demonstrated the existence of other effects showing that the electromagnetic forces act on the material of the conductor. In 1909 he applied these forces to impart rapid motion to masses of molten material and on this principle invented an electric furnace now in wide commercial use.

As early as 1883 he began the computation of conversion factors of electrical and mechanical energy, and he published a comprehensive book on this subject in 1904. A few years later he made a recalculation of all electrochemical equivalents. In 1908 he made an analysis of the interrelations of the various quantities of units entering into the calculation of light phenomena. That same year he described an experiment demonstrating a hitherto unrecognized factor in electromagnetic induction tending to show that Maxwell's well-known law of induction should be modified in order to become a universal law.

Dr. Hering was also one of that brilliant group of men who contributed to the upbuilding of the ELECTRICAL WORLD as a strong and forceful electrical engineering publication. In 1892 he was its technical editor, and in 1893 he originated its weekly "Digest of Current Electrical Literature," both foreign and domestic, which has come to be one of the well-recognized institutions of the electrical industry. This department he conducted for ten years.

He was one of the three men who in the fall of 1901 laid the plans for the organization in the following spring of the American Electrochemical Society, of which he was later elected president. He was also one of those who started *Electrochemical Industry*, now *Chemical and Metallurgical Engineer*. Dr. E. F. Roeber, the first editor of this paper, to whose brilliant work it owes much of its phenomenal growth, was at the time of his appointment Dr. Hering's assistant.

Dr. Hering was born in Philadelphia, March 29, 1860, and was educated at the University of Pennsylvania and in Germany. He has been a prolific writer on electrical engineering topics and until quite recently has represented American electrical engineers at almost all of the expositions and electrical congresses both here and abroad. He has twice received French decorations for these activities. He has been unusually prominent in association work and has the distinction of having been president of the American Institute of Electrical Engineers.

Electrical World

The consolidation of Electrical World, Electrical Engineer and American Electrician
Published by McGraw-Hill Company, Inc.

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Volume 78 New York, Saturday, November 19, 1921 *Number* 21

The Sacrifices of Disarmament

WE, AS an industry, are vitally concerned in the present conference on the limitations of armaments being held in the capital city of Washington. The modern battleship, costing complete about forty million dollars, has much electrical equipment, from the turbo-generators which supply the motive power for electric propulsion to the pocket spotlamp of the boatswain. The suggested abandonment of all capital ships on the building program is therefore not without interest to us. It means a large sacrifice from a peaceful industry for the ultimate good of mankind. The opportunity and the necessity are here together, and we gladly embrace both. Obviously nations cannot continue their mad orgy of war, nor can we, as an industry, permit selfishness or petty advantage to stand in the way of the realization of an era of permanent peace. Magnanimous we will be if by that means light may shine upon a darkened world. Unfortunately our civilization is as yet imperfect. We have not attained unto the ideal set for us by the humble Nazarene. Total disarmament is therefore neither expected nor desired. The millennium is not yet, but we are on the road to that blessed day when "nation shall not lift up sword against nation, neither shall they learn war any more," and the electrical industry is prepared to make any sacrifice to hasten that time, far distant though it be.

Standardization as a Weapon of Commerce

POSSIBLY the most significant thing, commercially speaking, that the world war has evolved is standardization. Prior to that eventful time standardization was desultory and squeamish. It neither asserted itself nor was it mildly acquiescent. Like the lily of the field, it toiled not neither did it spin. It simply enjoyed an anemic growth and was tolerated as an engineering fetish. War, however, served to reveal and emphasize our selfish and inefficient individualism and the futility of any hope of success under such handicaps. With the mobilization of all that America possessed—its men, industries, material, wealth and knowledge—came organized and scientific co-operation and an appreciation of the true value of standardization.

But we were not alone in our conclusions. Other industrial nations, like Great Britain and Germany, also realizing the saving grace of standardization, began at once to put it into practice. To what extent Germany has woven standardization into her industrial fabric is indicated in the report of the American Engineering Standards Committee. Needless to say, she has done the job in Teutonic fashion, thoroughly and effectively, and thereon hangs a threat to American industry. We aim in all manufacture today to increase efficiency and minimize industrial waste, but what hope have we of ever bringing this about until we are prepared to embrace standardization wholly and unconditionally? It is of little use to accept it as a principle and then fight foolishly upon its application. We can make no progress until we deal with the subject in a mood of mutual helpfulness. Such is the approach followed by the American Engineering Standards Committee, and it has aided admirably in bringing about the unification of industrial standards. The work of this committee, however, has only just begun because industry does not yet understand that standardization is first and foremost an economic and commercial weapon of immense value. With the broadening of this knowledge the full industrial significance of standardization will be more readily apparent, but it will not grow of itself. Industry must seek it and, having found it, should treasure it. In reasonable standardization lies the solution of many of our industrial and commercial problems.

Like Any Other Kind of Friendship

CUSTOMER relations are made up of little things. A word here, a bit of service there, a chance impression—and the thing is done. If the word is good, the bit of service prompt and cheerful and the chance impression pleasing, a new friend is made. But if these random contacts give offense, harm can be done beyond the power of many costly advertisements and much talking to correct. For such is human nature, and the business of the central-station company with the household is a very human business.

In this issue S. M. Kennedy tells in detail of the manner in which the "greater service" department of the Southern California Edison Company does its work. It is a story of little things consistently combined to make a mighty power for winning friends among the customers of this far-seeing utility. It should be read with closest attention, not only for the interest which it holds but because it offers many good suggestions useful to any company for the improvement of its contact with the community for which it works. Good relations with the public do not come by accident; they are slowly builded of good words and deeds, like any other kind of friendship.

A Comprehensive, Not a Makeshift, Development of Colorado River Needed

WE WERE glad to present last week some details regarding the projects for the development of the Colorado River which are in contemplation. As our readers are well aware, the Colorado is one of the very big streams of the country, carrying an enormous and extremely variable quantity of water, capable of immense good or evil, as the case may be. Running as it does through several states and emptying into the Gulf of California many miles across the Mexican border, it presents problems at once physical, commercial,

strategic and political. Its water, now running to wild waste, is needed for irrigation and for power development and must be restrained from going on the rampage.

The report under the Kincaid act presented a few months ago opens the way for a complete study of the development of the Colorado. The hydro-electric possibilities of the projected developments run to nearly 4,000,000 hp., merely including the actual projects on the Colorado already definitely considered. What the electrical growth of this great Western country is to be no one can safely predict. California, of course, has shown very great possibilities and rapid growth of population, but it would be essaying the rôle of the prophet to predict how much the other states reached by the valley of the Colorado may grow in agricultural activities, and how far the demands of California based on normal growth compare with the increase of population due chiefly to tourist enterprise. The possibilities of the irrigation of regions otherwise beyond cultivation by means of pumping must also be taken into account as one of the factors in providing a genuine, though seasonal, demand for power.

It is obvious, therefore, from the start that this development of the Colorado is of vast importance. When begun, it ought to be carried through in a manner thoroughly comprehensive, having in mind not the easiest method of attack for temporary results, but that form of project which will give to the far Southwest the largest possibilities of supporting greatly increased population by rendering fertile territory not yet doing its duty in the service of mankind.

International Exchange of Power Necessary to Development of St. Lawrence

AS PROJECTS for development and distribution of power on a vast and comprehensive scale gradually begin to assume form it is necessary to look about for all the possible unutilized hydraulic privileges as a part of the grand scheme of supply. Whether a "superpower" system in the form which has been sketched will actually come into service is of less importance than the certainty that some general interconnection will eventually be brought into being. In this connection a recent report of the St. Lawrence River projects assumes large importance. It is the result of international study and is directly of international interest, the more so since sooner or later a united plan of power supply must, on some equitable basis, permit the interchange of power between the United States and the neighboring and friendly Dominion of Canada. From Lake Ontario to Montreal the St. Lawrence, carrying the enormous flow of the entire great lake system, is about 182 miles long and in that distance falls 224 feet. The utilization of this fall involves a very large amount of work, for there are no very great single falls and the whole scheme of utilization is involved with the possible provision of a deep-water route from the sea into Lake Ontario.

To a certain extent these two uses of the great stream may seem incompatible, but projects have been worked out for a system of locks and power dams which permit both of navigation and of the development of power in so great amount as to be an important addition to the resources of the continent. The total amount indicated as available under the plans thus far made public is close to 4,000,000 hp.

Of the three great power sites which this report classifies as practicable to develop, the one at the Long Sault, the uppermost of the three, is international in its character and will aggregate about 1,500,000 hp.

Of the two lower projects, one well above Montreal, the St. Francis-St. Louis site, promises at least another 1,500,000 hp., and in addition the proposed Lachine Rapids development can be expanded to nearly 750,000 hp. It is going to be no small task to work out the full engineering features of these plants in their practical development and to arrange the international details of the plan, so involved with the problem of deep-water navigation. Nevertheless, it is entirely clear that the work should be done and should be undertaken at no distant date. The estimated cost of the complete canalization from the Great Lakes to Montreal, including the 1,500,000-hp. hydro-electric development at Long Sault, is figured at about $250,000,000.

Economy in Building Switching Structures

THREE principal elements of cost in the construction of outdoor racks for switching apparatus at distribution substations are the cost of the materials, the labor of erection and the supply of parts. These elements are, of course, axiomatic, but the careful consideration of the relative importance of each has, according to the article elsewhere in this issue by L. J. Moore, resulted in the greatest economy. As a result of experience the San Joaquin Light & Power Company has standardized upon a design of outdoor switching frames which are assembled from standard pipe and fittings. The use of such material has resulted in a low cost for materials and the greatest ease of construction in that no highly specialized labor is required. Of perhaps the most interest is the facility of obtaining the materials. As these are standard, they may be purchased in many places or carried in the warehouse stock at a small idle investment.

The durability of the structures is all that need be desired. To serve a rapidly growing territory it would be impracticable to erect structures designed for a service of three or four decades. Experience has shown that many changes and rebuildings would be required in such a period. The pipe framework is therefore a logical and an economical solution of the problem.

Industrial Electrical Records Pay

SCIENTIFIC management—which may equally well be called systematized common sense in administration—leaves less and less to fallible memory as the size of plants increases. Equipment accounting in industrial establishments is but a fledgling science compared with what we shall see in the future, but the design and application of suitable record systems for the use of the industrial electrical engineer is at last beginning to come into its own. The limitations of personal memory are too great and the value of nervous energy is too high to try to run plants much longer on the old basis of fragmentary—or worse—logs and reports of apparatus performance, which only serve to emphasize the uncertainties of recollection, unsupported by historic evidence in the offices of departmental executives.

In another column J. Elmer Housley describes the record system used by the electrical department of the Aluminum Ore Company, East St. Louis, Ill., embrac-

ing a connected motor load of 25,000 hp. As an example of clear-cut system, free apparently from needless complications and so well organized that data upon any portion of the plant covered and for any period since the installation totaled 10,000 hp. can be obtained at a glance, this material deserves much commendation. The care with which stock records, test and service records are prepared—and, what is more, maintained—insures the supply of unusually reliable information to company executives. The installation, indeed, is exceptionally large, but the careful reader will quickly see that the forms and methods described by Mr. Housley can be applied without undue expense to an immense range of smaller plants at present so lacking in these practices as to move even a field editor of an electrical journal to ask, "How long, oh, how long?"

We shall not recapitulate here the good things contained in this article, but in passing favorable comment should be made upon the methods of filing test records outlined and especially upon the careful preservation of graphic instrumental charts. It is nothing less than a triumph to be able to "spot" these months after they have been taken, and along with them to study the tabulations of test readings, repair outlays, etc., which throw so much light upon the fitness of equipment selection for specific tasks. Then, too, the method of keeping track of broken and missing lamps is one of wide possibilities elsewhere, and it is refreshing to find a company which has enough appreciation of its industrial electric trucks as economic tools to compile their written history periodically. Of course, to be of maximum value, such records must be analyzed and interpreted by experienced eyes and heads; but the beauty of the system described here is that it utilizes simple and well-tried means in such a straightforward fashion that one is surprised at the comprehensiveness of the layout. As basic data for graphic studies such records are very valuable indeed, and as time goes on we shall see their general application, modified, it may be, for local conditions, but welcomed and respected by industrial-plant executives who are today unaware of the economic worth of these systems.

Effectiveness of Partly Wet Insulators

NOTABLE work has been done toward developing insulators for lines to operate at voltages higher than any now in service, but thus far one very important phase has not been thoroughly covered. This concerns the changes that take place in the voltage gradient of a string of suspension insulators at the time when rain, fog or dew begins and at the time of drying off at the end of a moist period. These are critical times in the operation of such insulators.

Studies have been made, conclusions drawn and methods of protection against flashovers evolved when the strings are either wet or dry all over and all at the same time. But neither of these cases is in point. Although the voltage gradient and unit voltage duty on a string of dry insulators may be closely determined and controlled so that under normal or expected voltages the stress on the line-end units will be limited to the point where incipient flashovers will not form and be followed by cascading of the entire unit, and although when wet this same insulator string will survive the same voltages, yet flashovers are quite apt to occur under conditions of partial wetness. This is due to the destruction of the voltage gradient forcing the line-end units to undergo strains for which they were not designed. When drying off a similar disturbed condition results.

Practical experience with high-voltage lines has indicated that such a condition of partial wetness of the insulator strings is everywhere a vital one in the operation of such lines. Facilities for carrying on investigations of the nature required to determine an effective method of meeting this problem are somewhat limited, but the urgent need for an answer demands that the problem be attacked with vigor.

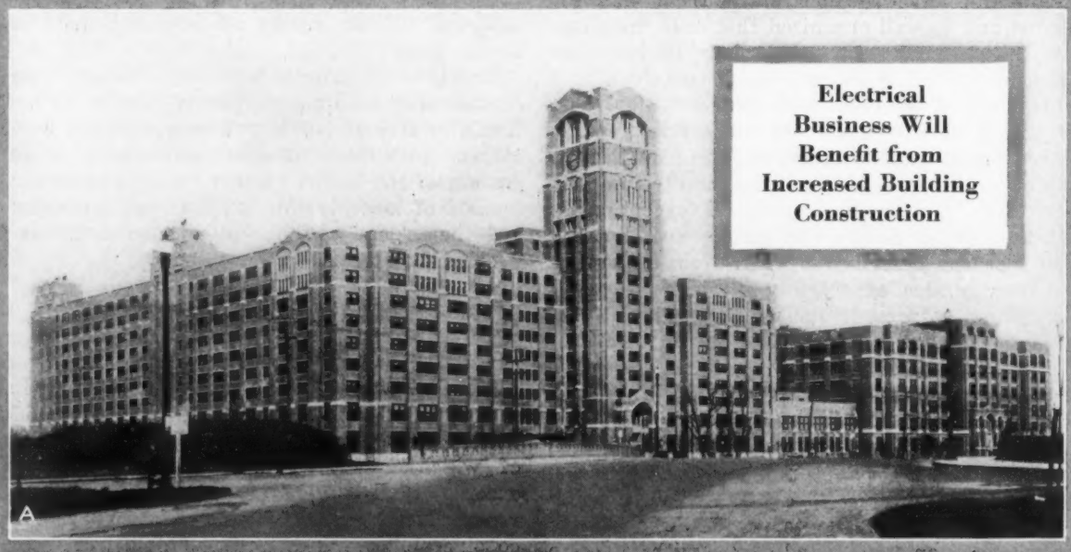
Better Appreciation of Value of Good Lighting

REPORTS of the I. E. S. committee on progress have always brought to view some notable illuminating practices and achievements, and this year's report, part of which was presented in our last issue, is no exception. The general tendency, as shown by the report, is to increase the illumination to an intensity considerably above that which would have been entirely acceptable a few years ago. Floodlighting of important buildings, inside and out, has been resumed, in some cases with rather notable results. The tendency is toward as effective concealment of the sources as is practicable, and where projectors are not used other special fixtures equally efficient in concealing are put into service. Indirect lighting, in this field of large areas and big units, has certainly taken on a new activity, and the semi-indirect methods have also been very largely developed by the improved adaptations of diffusing glass often considerably denser than has been generally utilized heretofore. The same tendency toward brighter lighting has appeared in department stores and other large commercial areas, where intensities are gradually working up into the region between 5 and 10 foot-candles. Indeed, these same intensities are becoming common in the general service of manufacturing.

The report indicates that there is a more complete realization that good lighting is doubly valuable where the operations in hand require quickness in recognizing detail. The demands of illumination for static vision, so to speak, are very much less than for dynamic vision. It is this particular fact that has recently compelled revision of many preconceived ideas about the intensities required for manufacturing operations.

Another rather notable tendency much to be commended is toward a better appreciation of the importance of cleanliness. There has been a good deal of study as to the amount of mischief done by dirt in reducing the illumination of working spaces. It is fully understood now that cleanliness is just as essential as the supply of proper lamps and suitable voltage, and there is a marked tendency to make the "luminaires" as unlikely to catch dirt as conditions permit. A good many finishes once common would not now be tolerated on account of the difficulty of cleaning. There is an increasingly strong inclination to use closed-in structures which can be readily dusted off on the exterior and retain a decent interior surface for a considerable period. The subject still deserves a good bit of study, especially in the rather large industrial units hung fairly high and not altogether easy to get at. The efficiency of any installation is a direct result of the care exercised in keeping it clean, and both methods and apparatus are in need of improvement.

Electrical Business Will Benefit from Increased Building Construction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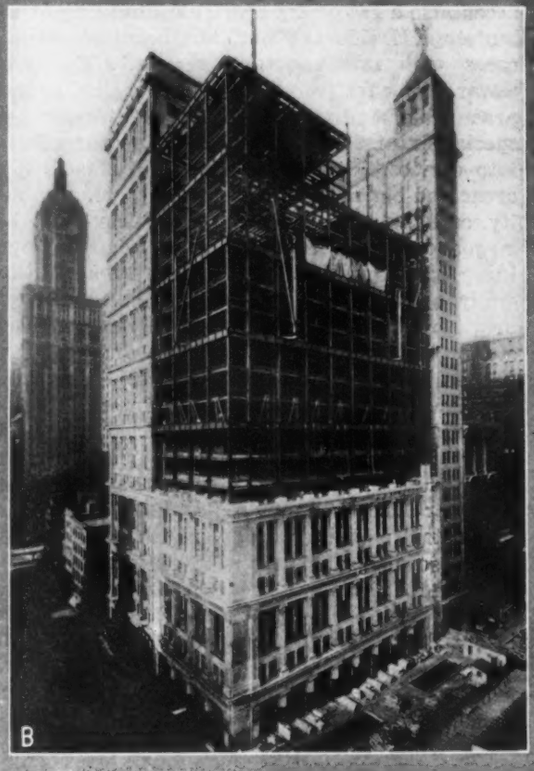
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DURING October over $73,000,000 in construction contracts were let for industrial and public buildings exclusive of federal and home building. Of this nearly $63,000,000 represents public building, which is the largest since May, 1920, and nearly three times the value of contracts let in October of the same year. Industrial construction is 50 per cent larger than it was this summer, there being marked activity in contracts of $100,000 and over.

This goes to indicate that a healthy increase in construction work is being maintained and that the electrical business is bound to benefit likewise. As an indication of the extent to which equipment will be required, five buildings which are under construction or have been completed have been picked at random and are shown here. The Sears-Roebuck Building, Philadelphia (A), alone will require about $400,000 worth of electrical equipment. The American Telephone & Telegraph Company's extension (B) will involve at least $100,000 worth of light and power equipment, and the Santa Fé shops (C) at Albuquerque, N. M., will take about $40,000 worth. The Federal Reserve Bank, Boston (D), will require over 200,000 ft. of interior wiring, 485 hp. in motors, thirteen elevators, a large electric kitchen for employees' restaurant and an elaborate signal system. French & Hubbard of Boston are consulting engineers for the bank construction, and the electrical work for all of the other buildings mentioned is to be or has been done by L. K. Comstock & Company, New York City.

How Greater Service Develops Public Relations Into Friendship

Detailed Description of the Manner in Which the "Department of Greater Service" Is Operating in Southern California and the Results that It Is Bringing to the Electric Light and Power Company

By S. M. KENNEDY

Vice-president in Charge of Business Development and Public Relations, Southern California Edison Company, Los Angeles

THE Southern California Edison Company through a recently organized "department of greater service" is deepening and broadening public relations throughout its territory into strong and spreading friendship. The story was told by S. M. Kennedy at the recent convention of the Stone & Webster Managers' Association in Boston. So great was the enthusiasm with which Mr. Kennedy's address was received that a second session was devoted in large part to questioning the speaker closely upon many phases of public relations. H. H. Hunt, of Stone & Webster, Inc., introduced Mr. Kennedy as one of the highest authorities in the country upon public relations, a pioneer worker in this field and a past-master in its development. Amid applause, a rising vote of thanks was tendered Mr. Kennedy for his inspiring address.

The Southern California Edison system now has an annual revenue of about $19,000,000, serving twenty-eight geographical districts with a total developed capacity of 425,000 kw. About sixty offices of the company are maintained in the twenty-eight districts. The system peak this year occurred on a forenoon in July and totaled about 240,000 kw. More than 260,000 customers are served. The greatest difficulty at present is to obtain enough meters to supply the new homes under construction. The experience of this company is, therefore, on a large scale, but the problems and policies have had the test of practice in the small communities embraced in this wide territory and thus are generally applicable. The broader principles underlying the need for such a department of greater service were discussed in an earlier paper by Mr. Kennedy published in the ELECTRICAL WORLD May 28, 1921, page 1280.

ON APRIL 1, 1921, a "department of greater service" was established by the Southern California Edison Company, manned by twenty employees specially trained for their new duties. The purpose of this department was to ascertain by personal calls upon customers whether the service is satisfactory, to give information about the relations of the company and its employees, details regarding rates, welfare and development work, and data upon the broader relations of the public and the utility organization. This department has now expanded to forty men who are constantly traveling about in local districts served by the company and are in intimate and friendly touch with all affairs which are of both general and company interest.

In calling upon a customer, the representative of the greater service department notes the mental attitude of the customer toward the company and later records it for a card-index file, classifying him as (a) in accord with the company, (b) indifferent to the company, (c) antagonistic to the company. A white card is filled out and filed at the office if a customer is in accord with the company, and a blue card is used in case of an unfavorable attitude. During these calls, but purely incidentally and not as a part of the security-marketing routine, the representative refers in passing to the customer-ownership department of the company, perhaps inquiring whether the customer has heard of it, and merely bringing it to his attention in a casual way that often leads to further inquiry and ultimate demand for participation in the stock ownership. The representative then leaves a folder and card and departs, the card bearing a statement of the representative's desire to render service at any time to the customer.

The reception that has been given to these representatives shows that the customers are talking about this new department and its work, and often the advent of a representative in a neighborhood is discussed about the dinner-table to such an extent that the way is paved for the visit. A sort of leaven is spreading through the company as a result of this closer contact with the public through the representatives. Employees are showing themselves more ambitious to render good service in local and general territory, and executives are learning much more about the company and its public relations through the reports which the greater service department men bring back. Community interest is being fostered, and the public good will gained is being held like a military objective which has been captured.

The folders which are used by the representatives of the department are four in number, one only being left with a customer after a call. One folder is entitled "The People's Project," another "Twenty-four Hours per Day—8,760 Hours per Year," a third "Edison and Its Partners" and the fourth "Who Is the Edison Company?" These folders in simple language set forth the interest of the public in the development of the company's service through popular stock ownership, the efforts made to insure continuous reliable service, the size and growth of the utility and the distributed ownership of the company. Wherever a customer becomes a stock "prospect" the fact is recorded on a pink card. All cards are sent to the district office of the representative and thence to the main office at Los Angeles for scrutiny, after which they are returned for filing to the district office.

Popular interest in the greater service department has led to the supplying of a desk for each representative at the district office to facilitate calls upon him by appointment. It was originally expected that these men would spend all their time in the field, but requests for appointments have increased sufficiently to warrant

some time being assigned in this way. Clerks, meter readers and other employees have become remarkably "keyed up" to more efficient service as a result of the work of this department. The public appreciates it so much that inquiries are frequently received asking why other utilities do not adopt the same plan of meeting the public on its home territory. The department is now well past the experimental stage.

The company makes every effort to go over its territory literally "with a fine-toothed comb" for complaints and leaves no stone unturned to settle these. There was one instance of a barber who was a customer of a predecessor company since purchased by the Edison system and who had been obliged, he said, to pay $20 years ago for a pole involved in connection with his service. No receipt had been made by the earlier company and no record was on the books. The barber was hostile to the Edison company and talked freely against it, and when the greater service department representative arrived on the scene the reason was divulged. The matter was brought to the company office, and instructions were issued to refund the money. The customer was so pleased that he immediately bought two shares of stock in the company and has since been a consistent friend of the utility. In another instance a woman customer was disturbed because her bills for service greatly exceeded those of her neighbors. An inquiry by the greater service department revealed a much larger use of socket appliances in the first woman's home, and this satisfactorily accounted for most of the difference.

The average district on the Edison system has about 10,000 customers, and the greater service representatives make about 600 calls each per month. The plan is to begin anew after making the rounds. The representatives range in age from thirty-five to fifty-five years, and a technical knowledge of the company's business is not required. Before they went into the field they were given a two weeks' training in the general offices, which included talks on the company organization, its finances, welfare work, development plans, and so on. After about thirty days in the field a man "hits his gait." The cost per representative is about $2,500 per year for this service. The men were all new and none were previously known in the districts to which they were assigned. This plan is proving more effective than utilizing "products" of a district in this newer service. These representatives do not handle troubles, their duties being strictly confined to the greater service department.

THE IMPORTANCE OF APPEARANCES

After twenty years' experience we have found that the public is observant and that well-kept properties are vitally essential to the best public relations. Decrepit steam plants, broken fences and fractured windows are a poor advertisement for a company selling securities to its local public. To neglect the appearance of substations in residential districts is a great mistake. Weeds and rubbish should not be tolerated. A tidy, clean and inviting property is a decided asset when scrutinized by the citizen or by the investor. Trimmed grass, clear driveways, well-painted buildings —in short, attractive plants and vehicles and well-kept lines—are of real value in public relations.

The appearance of company offices is of immense consequence from the public relations standpoint. People comment on the condition of these, and the policy of removing obstructions between the public and the employees and executives is one to be cultivated to the limit of practicability. We do not agree with advocates of high railings which keep the customer from coming into close touch with the personnel. In all the Edison offices the company has nothing showing above the level of the counter. Railings make the customer feel that he is an outsider. The company is entertaining guests in a very real sense when customers come into its offices, and it should act accordingly. Clerks should keep their desks clean and managers should have their desks placed where they can see all that goes on and be promptly accessible, as are the officers of many modern banks. In business hours the manager should be visible. The office employee has no excuse for standing behind a counter with an unshaven face or slovenly appearance. The public has a right to expect neatness in employees as well as courtesy from them. A company is judged by the men it keeps. Employees who are constitutionally unable to meet the public cheerfully and in a friendly fashion should be transferred behind the front office.

OPEN-HANDED PUBLICITY WILL WIN FRIENDS

To let the public know what a company is doing and what it proposes to do is most important. Utilities have nothing to conceal and should be proud to show the public every phase of the business. Proper advertising will help. Utilities should make judicious use of paid advertising space in the press and should also, through local officials and others, make friends with the editorial staffs of the dailies and weeklies. The opportunities for a district manager or other official to tell the utility story to the public are sometimes very attractive. Thus a woman's club may ask a manager to address it, or through proper channels such an opportunity may be obtained. The address to the membership should be at least summarized in advance and handed to the press in time to permit insertion if available, instead of waiting for an assigned reporter to write a "story" after the meeting and then very likely have it "killed" because the edition is already overset or so nearly filled with material that only a few lines can be inserted. Editors are becoming more critical, and real news value must be apparent in material sent to them. There are about 140 newspapers published in the territory served by the Southern California Edison Company, and we endeavor to follow this policy with all of them.

Public relations are no less important than the tangible delivery of kilowatt-hours to customers. To many people unfamiliar with utility problems the apparent tossing about of millions of dollars freely in annual reports seemed to signify ill-gotten gains, but a better understanding is coming. Employees must have the right ideas as to public policies, otherwise excellent plans and the best of managerial intentions are dissipated.

Unless the employees are in harmony with the company's ideas as to cultivating friendly relations with the public, little can be accomplished. You cannot overemphasize the importance of adequately training employees along these lines by repeated instructions and meetings to make clear the company's aims and policies. The employee must be brought to the point of being really interested in this work. Employees' clubs on the Edison system are making many helpful suggestions, and greater efficiency is being obtained. Pleas-

ing, agreeable manners in telephone operators, clerks and others are invaluable, and the plan of testing employees over the telephone by outside calls is sometimes advisable. It is not advisable to keep the same employee at a busy complaint window for more than four hours, in view of the strain to which he is subjected. Smoking is not permitted in employees' sections of the company offices during business hours.

In all this public relations work it is better to express the giving of information to the public as "informing the public" rather than to call it "educating the public," as we sometimes have it put.

It is most important that public utility companies, through their officials and employees, deal with their customers as individuals rather than handle them in groups, communities and districts. It is the injection of personality into business that makes friends—the more personality the more friends. If the individuals are recognized and pleased, then the public must be pleased because it is made up of individuals. Under such conditions the problem of public relations becomes solved, and the utility company cannot ask for anything reasonable from the community which will not be granted.

Efficient Record System for Industrial Electrical Department

Pays for Itself by Insuring that Proper Equipment Is Installed and that It Is Operated Economically and Kept in Efficient Condition—Forms Are Shown for Motors, Lamps and Also for Industrial Trucks

By J. ELMER HOUSLEY
Electrical Engineer Aluminum Ore Company, East St. Louis, Ill.

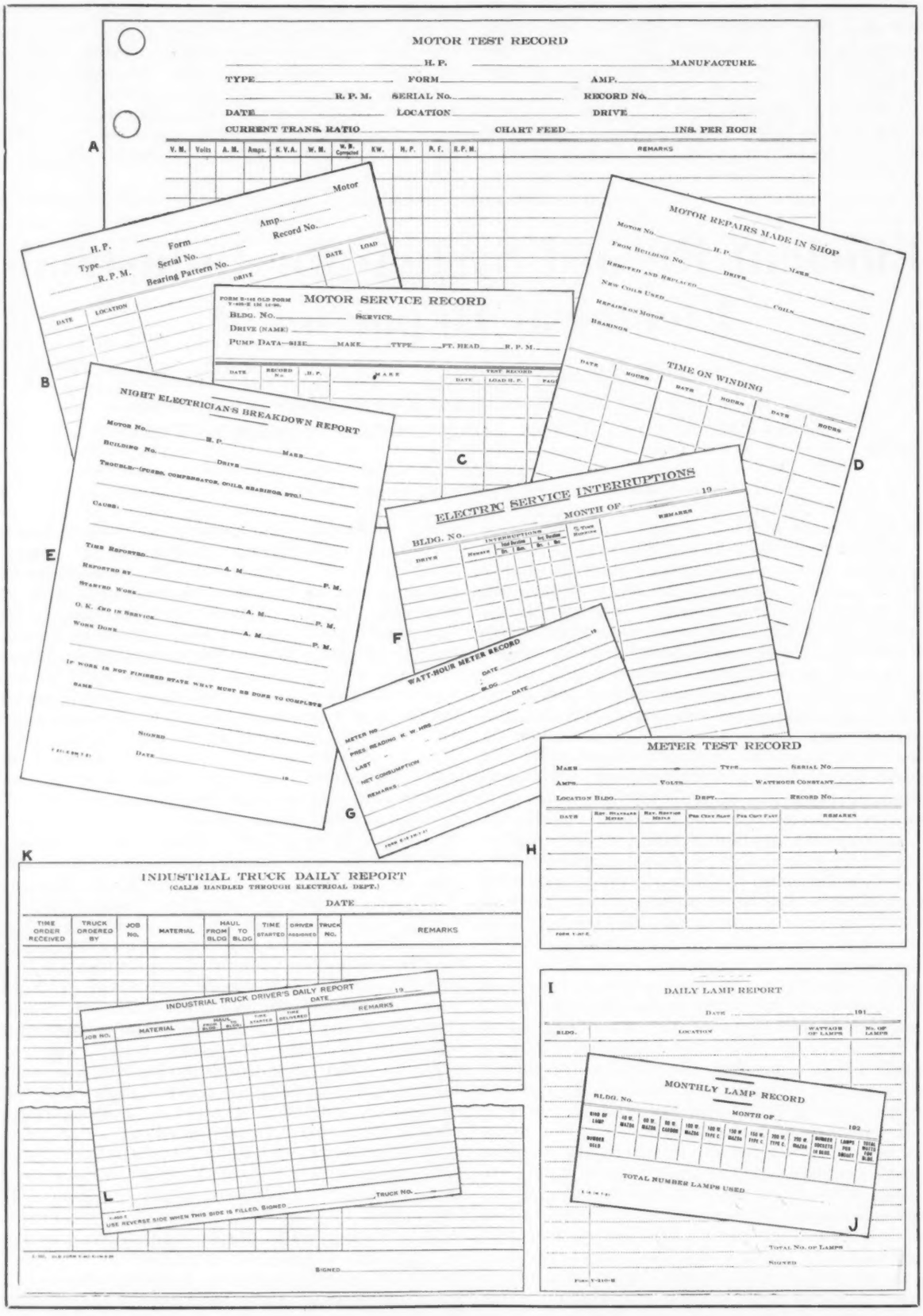
THE heads of the electrical department of a large industrial plant must keep themselves free from a mass of detail work and yet have all facts pertaining to their department instantly accessible. One of the most important details of organization to bring this about is a record system which will leave a history of all that has happened and show the trend toward future conditions. The record system to be adquate should always be such that in the absence of any member of the department no vital information would be inaccessible. The determination of the extent to which the record system should be developed in any plant deserves the most careful consideration of executives of the electrical, accounting, cost, engineering, power and storekeeping departments or of whoever may handle the duties of these departments. Where interchange of data is made between interested departments, the data should be presented either on a form sheet or in mimeographed outline in order that the reports shall contain all essential information and not necessitate further correspondence or consultation between the departments.

The responsibility for the maintenance of the record system with which the writer is familiar has usually been centered in some technical man, as a rule a student just entering the industrial field. The training is in itself valuable to a man just out of college because it quickly gives him a grasp of the extent of the workings of a large electrical department and presents a graphic view of the problems confronting it.

The record system which is described here was developed gradually as the system grew from one employing 10,000 hp. in motors to one having a 25,000-hp. connected load. The service for the most part is twenty-four hours per day all the year around with difficult operating conditions. This would naturally make the number of motor changes during the course of a year run rather high, with a corresponding high mortality among the motor bearings. The first step in the record system is the plant serial number, which is affixed to the motor as it enters the storeroom and is noted on the receiving entry made out by the receiving department. This serial number is also recorded in a loose-leaf book by the electrical department with complete data from the name plate of the motor. Order number and purchase price are recorded in this book and any additional data desired concerning the intended use of the motor and where it should be delivered in the plant or if to be stored for reserve. A form is not used for the loose-leaf book on account of the various types and classes of machines which are received. When slip-ring or direct-current motors are received complete data regarding make, grade and size of the carbon brushes used and the brush rigging are recorded. The essential portion of this record is then transcribed on the "Motor Record Card," which is illustrated at B and shows the data carried by this card. The card is then filed according to horsepower rating. This index is divided into two sections—the "Active Index" and the "Motors-in-Stock Index." The "Active Index" contains all motors which are installed on some job, and the "Motors-in-Stock" are all of those which are in the shop for repairs, the spares which are kept on the shop floor or the motors still held in the storeroom. Space is provided on the card to show the last location of the motor and the date it was placed there. It should be noted here that spare motors under this plan are not charged back into the stores account, since every motor when it is received is charged to a general motor account which covers the entire plant.

An index called the "Motor Service Record" is composed of cards (see C), one of which is made out for each individual or group drive requiring a motor. This index covers information as to class of service—whether it is continuous duty, day or night service, or intermittent duty. Since a large proportion of the drives are on centrifugal pumps, space is provided on the card for data concerning the pump characteristics. A blank line is provided for other data. Space is provided for the date on which each different motor was installed on the

Record System Which Saves Its Cost Many Times


A
MOTOR TEST RECORD
H. P.
MANUFACTURE
TYPE
FORM
AMP.
R. P. M.
SERIAL No.
RECORD No.
DATE
LOCATION
DRIVE
CURRENT TRANS. RATIO
CHART FEED
INS. PER HOUR
V. M. | Volts | A. M. | Amps. | K.V.A. | W. M. | W.P. Corrected | KW. | H.P. | P.F. | R.P.M. | REMARKS
B
H.P. Motor
Type Form Amp.
R.P.M. Serial No. Record No.
Bearing Pattern No.
DATE | LOAD | DATE | LOCATION
DRIVE
C
MOTOR SERVICE RECORD
BLDG. No. SERVICE
DRIVE (NAME)
PUMP DATA—SIZE MAKE TYPE FT. HEAD R. P. M.
DATE | RECORD No. | H. P. | NAME | TEST RECORD | DATE | LOAD H. P.
D
MOTOR REPAIRS MADE IN SHOP
Motor No. H. P. Make
From Building No. Drive
Removed and Replaced
New Coils Used Coils
Repairs on Motor
Bearings
TIME ON WINDING
DATE | HOURS | DATE | HOURS | DATE | HOURS
E
NIGHT ELECTRICIAN'S BREAKDOWN REPORT
Motor No. H. P. Make
Building No. Drive
Trouble:—(Fuses, compressor, coils, bearings, etc.)
Cause:
Time Reported
Reported by A. M. P. M.
Started Work
O. K. and in Service A. M. P. M.
Work Done A. M. P. M.
If work is not finished state what must be done to complete
Name
Signed
Date 19
F
ELECTRIC SERVICE INTERRUPTIONS
MONTH OF 19
BLDG. No.
DRIVE | INTERRUPTIONS Number | Total Duration Hr. | Min. | Av. Duration Hr. | Min. | % Time Running | REMARKS
G
WATT-HOUR METER RECORD
19
DATE
BLDG.
DATE
METER No.
PRES. READING K. W. HRS.
LAST
NET CONSUMPTION
REMARKS
H
METER TEST RECORD
Make Type Serial No.
Amps. Volts Watthour Constant
Location Bldg. Dept. Record No.
DATE | Rev. Standard Meter | Rev. Service Meter | Per Cent Slow | Per Cent Fast | REMARKS
K
INDUSTRIAL TRUCK DAILY REPORT
(CALLS HANDLED THROUGH ELECTRICAL DEPT.)
DATE
TIME ORDER RECEIVED | TRUCK ORDERED BY | JOB No. | MATERIAL | HAUL FROM BLDG. | HAUL TO BLDG. | TIME STARTED | DRIVER ASSIGNED | TRUCK No. | REMARKS
L
INDUSTRIAL TRUCK DRIVER'S DAILY REPORT
DATE 19
JOB NO. | MATERIAL | HAUL FROM BLDG. | HAUL TO BLDG. | TIME STARTED | TIME DELIVERED | REMARKS
USE REVERSE SIDE WHEN THIS SIDE IS FILLED. SIGNED TRUCK NO.
SIGNED
I
DAILY LAMP REPORT
DATE 191
BLDG. | LOCATION | WATTAGE OF LAMPS | No. OF LAMPS
J
MONTHLY LAMP RECORD
BLDG. No.
MONTH OF 192
KIND OF LAMP | 40 W. MAZDA | 60 W. MAZDA | 80 W. CARBON | 100 W. MAZDA | 100 W. TIPP. C. | 150 W. MAZDA | 150 W. TIPP. C. | 200 W. TIPP. C. | 250 W. MAZDA | NUMBER SOCKETS IN BLDG. | LAMPS PER CIRCUIT | TOTAL WATTS PER BLDG.
RUBBER USED
TOTAL NUMBER LAMPS USED
TOTAL No. OF LAMPS
SIGNED

drive, the plant serial number, horsepower and make, and the record of all tests made on each particular drive, giving the date of the test, the average load and the page number of that particular test in the "Motor Test Record" described later. Should detailed information on the test be desired, reference can be quickly made to the page of the "Motor Test Record" book, which gives the complete data covering the test. The recording-meter chart may also be consulted by finding the chart which is numbered to correspond with the page number of the test. These two forms are printed on 4-in. x 6-in. cards.

The former, or "Motor Record Card," has nine spaces and the "Motor Service Record" has eight spaces. When the card is filled it is only necessary to put the filled card in the rear of the file, and a new card is made up with "duplicate" written across the corner. Only in rare instances is it necessary to look up the original card, and consequently it is not necessary to keep the two cards together or to utilize the back of the card.

The "Motor Test Record" (see A) sheets are kept in a loose-leaf binder. The pages are punched for the binder posts and were made 9½ in. x 12 in. in order to give ample room for complete records on any test. When a new page is entered in the back it receives a consecutive number and a numerical list of contents appears at the front of the book. As most of the tests are on induction motors, the form was made out for polyphase meter readings. Space is provided for the original readings taken on the instruments. These readings are always transcribed from a pocket notebook on the day of the test even if the test is not written up that day, in order to eliminate as far as possible any mistake in using meter constants while engrossed in the work connected with making the test. No attempt is made to provide definite spaces for such data as tonnage or volume of materials handled or data concerning the pressures and quantities handled by pumps. All of these data which the test would indicate as necessary are recorded under "Remarks." All tests are made with portable graphic recording wattmeters, and the strip charts from these tests are filed by themselves, each chart being numbered to correspond to the page covering this test in the motor test book. The charts, which are 6 in. wide, are filed in a very convenient method by rolling each chart up tight and fastening the roll at each end with paper clips to a plain 4-in x 6-in. index card. Each card will accommodate five to seven charts and at its top carries the numbers for the charts which are attached to this card. After the rolled chart is filed the chart number is placed on the exposed side of the roll. In this way a large number of bulky charts may be filed in a minimum of space. We have found that it is highly desirable to have these charts easily accessible as it is often advantageous to consult them in order to interpret properly the average figures which are shown in the motor test book and to visualize the load curve where variable loads are encountered.

A large shop force is maintained for the repair and rewinding of the motors coming in from the plant. It is very desirable to maintain complete data as to the amount and nature of repairs as well as on the time required for repairing the various makes of machines, the different departments of the plant and the ability of the different men employed on the repair jobs. This is done on the form illustrated at D. It sometimes develops that a particular type of motor is not at all suitable for certain classes of service in the plant. The selection of the proper motor by the engineering department can often be aided by pertinent data compiled from the shop records of rewinding and repairs as well as from test data compiled from various drives. Data of this kind should not be applied indiscriminately in the choice of new equipment but should be used in the light of personal experience of the men responsible for the repairs.

The form of data covering the rewinding of motors has been particularly valuable in the determination of the proper application of open-slot motors in the 5-hp., 25-cycle size, which is not a standard motor with all manufacturers. Data covering the number of burnouts, the time required for rewinding and the value of various impregnations for the closed-slot type of construction were obtained and demonstrated the poor economy of a motor with slot partly closed for service in the presence of chemicals and excess moisture.

BREAKDOWN REPORTS PERMIT ANALYSIS OF TROUBLES

In order to record properly all electrical breakdowns, a form is furnished which is called the "Electrician's Breakdown Report" (see E). It provides for information covering the motor name-plate data, the building and drive and the kind of trouble encountered, with a statement concerning the time required for the repairs and the time the drive went back into service. Space is provided for mention of any new motors or compensators which may be installed. One of these reports is made out by the shift electrician for each breakdown handled by him. This report is the only clerical work required from workmen, and it is required only from the "trouble-shooters" who handle breakdowns or repair jobs through the plant, because it is much more desirable to keep a high-priced mechanic busy with his tools rather than have him enter the clerical field where less skilled persons can do the work. Such a report as is required should, above all, be accurate as to transfers of equipment, and the men should be held strictly accountable for any errors found in checking reports. From this report are secured the data for changes to the "Motor Record Index" and the "Motor Service Index." As an additional check, each breakdown sheet is checked against the motors which are brought into the shop and those which are taken out of the shop after being tagged "O.K." The form for this "Electrician's Breakdown Report" is printed on sheets 5½ in. x 8 in., which are furnished to the electricians in block form.

Where continuous operation is encountered and it is not possible to provide duplicate drives, it is vitally necessary for the electrical department to have an accurate record of the time during which any particular drive is shut down for electrical repairs, both to clear the responsibility for unnecessary delays and to furnish data concerning reliability of types of motors, systems of oiling or grade of oils and reliability of different types of compensators. This information, taken from the "Electrician's Breakdown Report," is incorporated into a card form called "Electric Service Interruptions" (F). The report is summarized by buildings for each month. Space is provided for data on fourteen drives, and additional cards may be utilized if the space is insufficient. The data noted on the cards give the number of interruptions per drive, the total time the drive was down and the average time the drive was down for each interruption. When desired, the percentage of the time the machine was actually running is shown. Ample space is provided for remarks concern-

ing pertinent information as to causes of the interruption. The causes may be shown as low bearings, coils shorted, coils grounded, coils cut out, compensator failure, etc., and these reasons may be tabulated when investigations of troubles are made or during an unusual run of trouble such as is caused by changing operating conditions, temperature changes or inefficient personnel.

For the benefit of the accounting, cost and power departments a watt-hour meter record card is made out the first of each month covering each meter in the plant (see G). These records on cards are also a valuable aid to the electrical department for use in tracing seasonal or periodic changes in the power demand in various departments. Considerable care should be exercised in planning the power distribution lines with respect to facilities for metering both the present and future power requirements of the various departments. Estimates of power required are never sufficiently accurate, regardless of the methods employed in reaching the estimated figures.

The watt-hour meters throughout the plant are tested regularly and a "Meter Test Card" (H) is made out for each meter upon installation, a new card being made out each time the meter is moved to a new location. Ordinarily the meters are tested about once every year. Should an unexpected variation in reading occur, an immediate investigation is made, and often it is found that a potential fuse has blown.

CAUSES OF LAMP LOSS DETERMINED FROM RECORDS

A large industrial plant will use several thousand dollars' worth of incandescent lamps in the course of a year, and large sums are spent for guards and special fixtures to prevent the unauthorized removal of lamps from the sockets and reflectors about the plant. The ideal method of lighting would be to use large units high enough to be out of reach; but with the many passageways, stairs and galleries in the general run of plant buildings, it is impossible to keep the lamps out of reaching or climbing distance. The various methods taken to prevent the removal of lamps will not be taken up here, but rather the record system which tells what becomes of the 1,500 lamps normally replaced every month. Four lamp washers are responsible for the replacement of missing or broken lamps. Every day they record the lamps replaced on a 6-in. x 6-in. printed card (I) with thirteen lines, each line providing for the building number, the location or circuit number, the wattage of the lamp used and the number of lamps replaced. For additional record the men are required to put the letter "M" after the number of lamps which are missing, the others replaced being those found with a stub of the bulb or a burned-out bulb remaining. A monthly summary by buildings is made on a printed 2½-in. x 5-in. card which shows the number of lamps of each size used, together with the distinguishing letter as to whether missing or burned out. The total number of lamps used for the month for each building is shown. From these data monthly lamp-consumption curves are prepared and variations are traced down to find whether they are caused by construction work, an unusual amount of repairs or unauthorized removal from the plant by individuals.

A very complete and efficient system to meet the special conditions in this plant was worked out for handling sixteen industrial platform electric trucks, one tractor and four large trailers. The method employed took into consideration that all calls should be handled through the automatic telephone, which makes virtually every building accessible to the truck-dispatching office connected with the garage and electric shop. To schedule the trucks properly it is necessary to have a record of the time the call is received, the time the truck starts and the times the material is delivered. The same is true of the trailers because they will stand idle or keep the loading gangs waiting if not kept on a time schedule for loading, unloading and delivery. The cost of operating each truck is charged to each job number covering the material handled, and the nature and quantity must be known in order to dispatch the proper truck or trailer.

These requirements led to the development of the "Industrial Truck Daily Report" for use of the dispatcher in recording the requests for trucks (see form K). The form is printed on an 8½-in. x 11-in. sheet which has forty-five lines and is furnished in blocks. As may be noted from the illustration, a complete record is obtained which permits of the ready tracing of any material that cannot be found and constitutes a written record in cases of disputes as to the cause of delays in getting a truck to the job. In order to keep a check on each driver and a record of the actual time of delivery, each driver is furnished every day with a printed "Industrial Truck Driver's Daily Report" card (L), 4 in. x 6 in. in size, on which he fills out a line for each delivery made. The card is ruled on both sides with a total space for thirty-three trips, since the average number of deliveries per truck was found to be about twenty-five per day.

Transformer Development Is Recalled by Anniversary

Twenty-five Years Ago 935-Kva., 22,000-Volt Units Operated for First Time on Niagara-Buffalo Transmission Line

BY W. S. MOODY
Engineer Transformer Department, General Electric Company

A QUARTER century of experience in the development of power transformers, together with certain practical lessons which may be drawn therefrom, is recalled by the celebration this month of the twenty-fifth anniversary of the opening of the transmission line between Niagara Falls and Buffalo. This took place on Nov. 16, 1896, when current from Niagara Falls was first transmitted to operate cars on the Buffalo Street Railway. It marked the complete success of one of the earliest and most important transmission enterprises, which dated from the incorporation of the Niagara Power Company in 1886.

One of the most interesting problems connected with this undertaking involved the building of the transformer equipment.

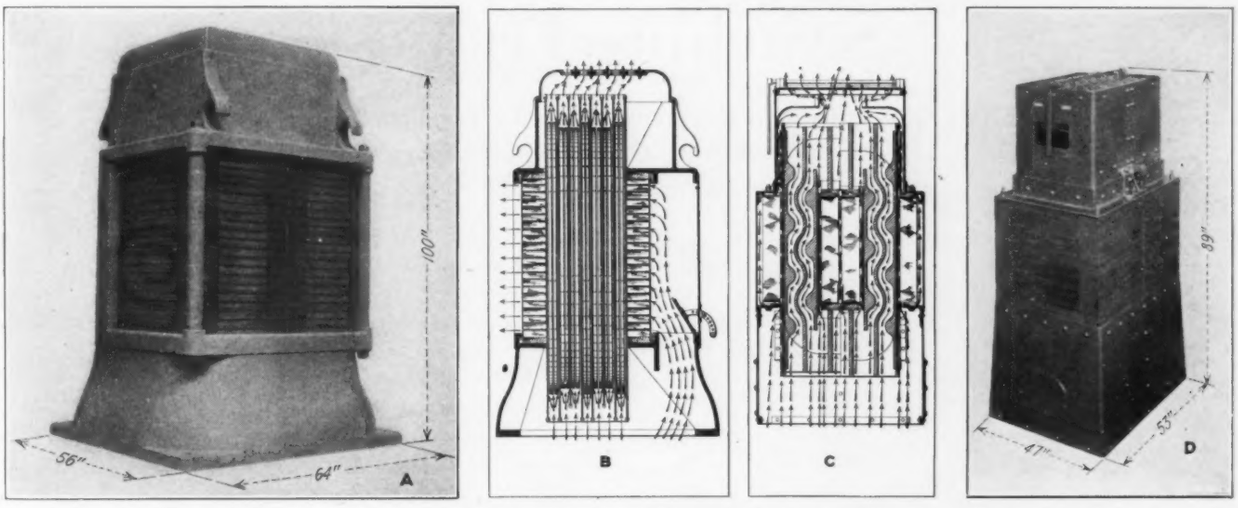
Such a problem as was then presented—namely, the design of 25-cycle, 935-kva., 2,200/22,000-volt, two-phase-to-three-phase transformers is comparatively elementary today. It is one which might, in fact, safely be assigned to a junior engineer of a few years' practical experience, yet in 1896 it was a serious task and one which was looked upon with certain misgivings.

A review of the state of the art at that time and the manner in which difficulties were overcome holds a

lesson not without its practical side for the engineering fraternity today. If, as was the case, engineers were called upon then to build transformer apparatus five times as large as the largest then existing air-cooled units and four times the voltage with which any one had had actual experience—and did it successfully—why should we not look forward with confidence to solving future problems which may present quite as many obstacles?

FIRST TRANSFORMERS IN 1887

The first static transformers were built commercially in 1887. Five years thereafter the art had progressed only sufficiently to enable 7½-kva., 1,000-volt transformers to be successfully built, and some experienced engineers then made the claim that larger sizes would be impracticable. Three years later, in 1894, however, it was learned how to build successful self-cooled oil-immersed units up to 25 kva. or 30 kva. at 2,000 volts; also air-cooled designs commonly called "natural draft" up to 100 kva. and forced air-cooled units up to 200 kva.



EXTERIORS AND CROSS-SECTIONS OF ORIGINAL NIAGARA AIR BLAST TRANSFORMER AND A PRESENT-DAY UNIT

Almost simultaneously with the designing of the 935-kva. Niagara transformers, a limited number of low-voltage oil-immersed transformers running up to 750 kva. in size were constructed, but these were not completed in time to make any real use of the experience in connection with the larger and much higher voltage transformers for the transmission in question. Moreover, oil-immersed transformers in large sizes were then looked upon as experimental, and the possibility of their general use was seriously questioned, because of the supposedly great fire risk involved in such large units if oil-immersed. Both manufacturers and operating engineers looked with distrust at that time on large oil-filled transformers. Experience had not shown how rarely such units would take fire even if internal short circuits should develop. As an outdoor installation was unthought of, the imaginary fire risk seemed prohibitively great.

Consequently, during the two or three years immediately preceding engineers had been called upon to build a large number of transformers cooled by forced air, but they were limited in size to 200 kva. and in voltage to 10,000. None of these had undergone service test when the Niagara units were designed. In these designs the cooling air passed alternately through ducts in the core and ducts between the coils. Therefore no continuous insulation could be placed between the coils and core. Consequently the insulation had to be placed on the individual coils if a reasonable "space factor" was to exist in the winding.

The limitations in voltage set by the earlier construction were foreseen, and a construction was worked out for the 22,000-volt Niagara transformers in which the air ducts in the core and the air ducts between coils were fed from independent air chambers. As shown in Fig. B, the windings could be separated from the core by a continuous housing of insulation of any necessary thickness, because no heat or air has to be transferred through this insulation. With similar insulating barriers between coils or groups of coils, the amount of insulation on the coils could be limited to only that necessary to insulate each turn from the adjacent turn. With such a construction it is unnecessary to carry heat through any considerable amount of insulation before it is delivered to the cooling air.

The Niagara type of construction eventually became standard for all air-blast transformers and has remained so up to the present time, except for the slight modification shown in Fig. C. In this latest construction (made possible by the reduced core losses resulting from the use of improved steel and the improved thermal efficiency that comes from using a construction that does not require the passage of heat from sheet to sheet of the laminated structure) the core ducts are also vertical but still independent of the coil ducts. This construction allows far better space factor in the core than when

COMPARISON OF MODERN AIR-COOLED TRANSFORMER WITH UNITS INSTALLED TWENTY-FIVE YEARS AGO

	Niagara Units, 1896 Design	Present Practice
Efficiency (per cent):		
Full load	98.20	98.00
Half load	98.90	98.03
Temperature rise, full load (deg. C.)	50	55
Weights (lb.):		
Active material	12,815	7,500
Mechanical parts	6,160	2,240
Total	18,975	9,740
Floor space (in.)	56x64	47x53
Cubical content (cu.in.)	358,000	127,500
Cubic content relative (per cent)	282	100

ducts were parallel to the laminations and separates the iron from all insulation by cool-air ducts. Consequently core temperatures need not be limited to safe insulation temperatures, since modern silicon steel is non-aging.

Unfortunately the first Niagara generators were wound for quarter phase so that the transformers had to be made to transform phases as well as voltage. The early work of Thomson, Scott and Steinmetz had pointed out how this might be done, but little practical experience was available. This part of the problem, however, was so successfully solved as to give the three-phase voltage as perfect balance as necessary under the operating conditions which have existed.

Even at that time it was generally known that primary and secondary coils in a transformer tend to repel each other when carrying load, and that in a unit of this size this force must be considerable at the time of short circuits on the line. However, no one had any definite idea of what these forces were, for no one had even suggested a method by which they might be calculated, and experience was entirely lacking. Fortunately the generators had rather high reactance, and the mechanical layout of the transformer coils and insulation was so substantial that trouble from this source did not become appreciable even later when the total generator capacity at Niagara became very large.

A comparison of operating data, weights, etc., of these transformers and up-to-date design for the same service is here given to show that while great progress has been made in the intervening twenty-five years, yet the old designs were, taken by and large, remarkably good.

Standard Pipe and Fittings for Outdoor Switching Frames

Found More Convenient to Keep in Stock and Transport—Do Not Require Special Labor for Assembly—Can Be Quickly Erected and Stand Service Better than Wood Frames

By L. J. MOORE
Electrical Engineer San Joaquin Light & Power Corporation

STRUCTURAL steel and wood poles are still used and will probably always be required in many cases for high-tension switching frameworks, but the San Joaquin Light & Power Corporation has found that pipe frameworks are very desirable for outdoor structures under some conditions. For example, in the cases where they have been used they have been found cheaper to install than either structural-steel or wood-pole frames. Being convenient to keep in stock, the pipe, fittings, clamps, etc., are always readily available and can be easily transported. It does not require special labor to assemble the parts. The work can be easily done in the field, and the speed of erection is greater than for frameworks of other material.

Outdoor transfer buses have been used for the outgoing feeders of all 11,000-volt substations of the San Joaquin Light & Power Corporation for a considerable time. The feeder switches and main buses are installed inside the buildings at these substations, together with disconnecting switches between the oil switches and the 11,000-volt bus. The disconnecting switches on the line side of the feeder switches, however, are installed outside on the transfer-bus structure. The transfer bus is tapped to the outgoing lines through a set of disconnecting switches for each line, connection being made just outside of the line "disconnects," which are between the line and the oil switch. This connection is shown by the one-line diagram at the left and middle of the accompanying drawing. This transfer bus is very useful in allowing two or more line circuits to be carried through one oil switch, thus making it readily possible to make repairs to oil switches, current transformers and other apparatus without interruption to service. Furthermore, automatic protection is still kept on all circuits, but of course one switch will control two circuits for the time being, instead of one. As the

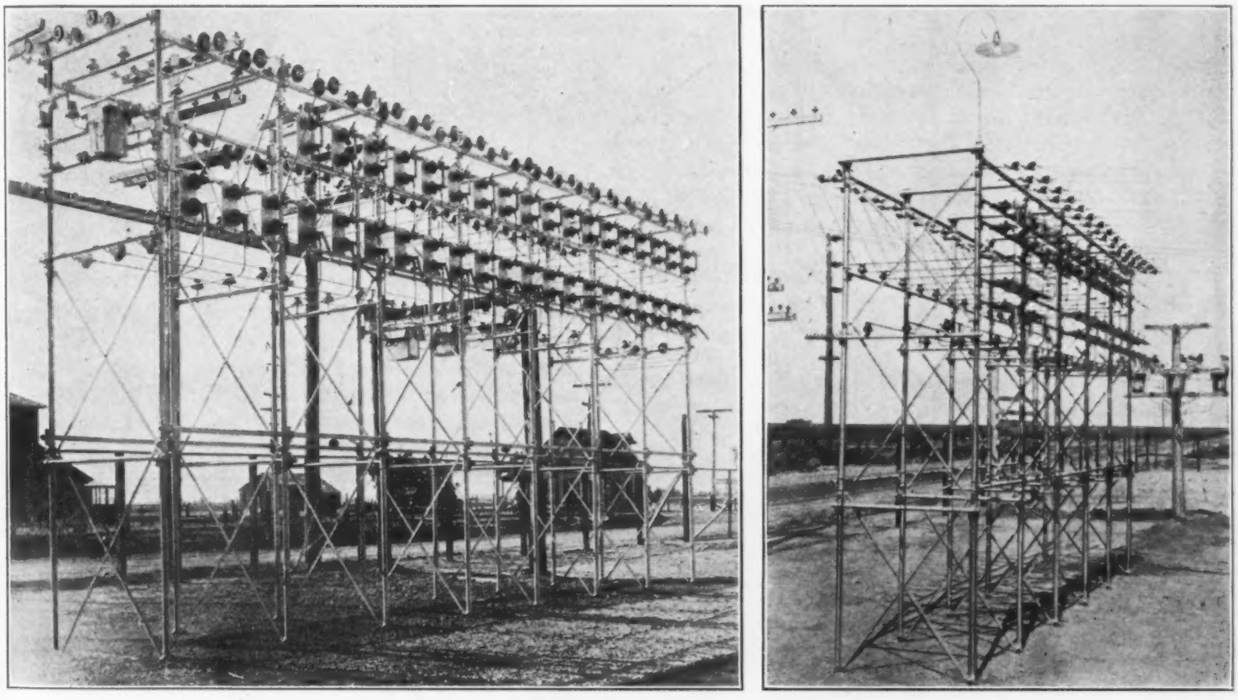
LIST OF MATERIAL FOR PIPE-FRAME OUTDOOR TRANSFER-BUS STRUCTURE

This is for the four-circuit structure shown in the upper part of the accompanying drawing.

Quantity: Transformer Addition	Quantity: Main Transfer Structure	Material
2 pieces	2 pieces	2-in. galvanized wrought-iron pipe, 21 ft. 8 in. long.
	2 pieces	2-in. galvanized wrought-iron pipe, 16 ft. 8 in. long, threads one end.
	2 pieces	2-in. galvanized wrought-iron pipe, 4 ft. 9 in. long, threads one end.
	2	2-in. x 2-in. x ½-in. extra-heavy pipe T's.
	2 pieces	2-in. galvanized wrought-iron pipe, 20 ft. 6 in. long.
3 pieces	5 pieces	2-in. galvanized wrought-iron pipe, 5 ft. 6 in. long.
3 pieces	7 pieces	1½-in. galvanized wrought-iron pipe, 20 ft. 6 in. long.
6 pieces	10 pieces	1½-in. galvanized wrought-iron pipe, 5 ft. 6 in. long.
2 pieces	10 pieces	Wrought-iron bar ¼x1½ in., 7 ft. 3 in. long.
2 pieces	10 pieces	Wrought-iron bar ¼x1½-in., 7 ft. 6 in. long.
2 pieces	10 pieces	Wrought-iron bar, ¼x1½-in., 7 ft. 9 in. long.
8	40	E.E.E. clamp T clevis, No. 5147.
4	20	E.E.E. U-bolt clamp cross, No. 5190.
8	55	E.E.E. U-bolt clamp cross, No. 5189.
3	15	E.E.E. insulator pin, No. 4001.
3	15	Locke insulator, No. 6512.
15 in.	65 in.	½-in. copper tubing, standard pipe size.
8	40	Machine bolts, ½x1½ in.
2	10	Machine bolts, ½x3½ in.
3 pieces	15 pieces	½-in. sq. bars, 2 ft. 0 in. long.
4 pieces	20 pieces	½-in. sq. bars, 6 ft. 3 in. long.
2 pieces	10 pieces	2x2x¼-in. angle, 2 ft. 0 in. long.
1	5	Concrete base, 0.52 cu.yd. each.
	2	2x½-in. pipe reducers.
	2 pieces	½-in. conduit, 12 ft. 2 in. long.
	2 pieces	¼x1-in. wrought-iron bar, 2 ft. 0 in. long.
	2 pieces	¼x1-in. wrought-iron bar, 4 ft. 0 in. long.
	2 pieces	X-5403 Benjamin socket and 18-in. reflector.
Wiring material for one circuit:		
6	12	Dossert connectors.
3	6	LG-seven disconnecting switch pipe mounting.
	52 ft.	½-in. copper tubing, standard pipe size.
29 ft.	.....	½-in. copper tubing, standard pipe size.
	3	E.E.E. insulator pin, No. 4001.
	3	Locke insulators, No. 6512.
3	12	Thomas insulators, No. 1056.
3	6	Hook bolts, ½x4 in.

transfer bus and line disconnecting switches are installed outdoors, it is possible to clean or change entrance bushings when necessary.

The first structures were made of wood, but on account of the difficulty of keeping parts lined up and of keeping the structure from loosening after seasoning such construction has been abandoned. The next step was to use structural steel, and two racks of that construction were made. These were satisfactory except for the fact that in the design too great a height was allowed and it was difficult to operate the "disconnects," especially at night. This problem was solved by providing a raised walkway. Another difficulty was that such a rack usually had to be purchased from a structural-steel shop and slow deliveries might interfere with construction. The pipe frame in the upper part of the drawing was then finally evolved.



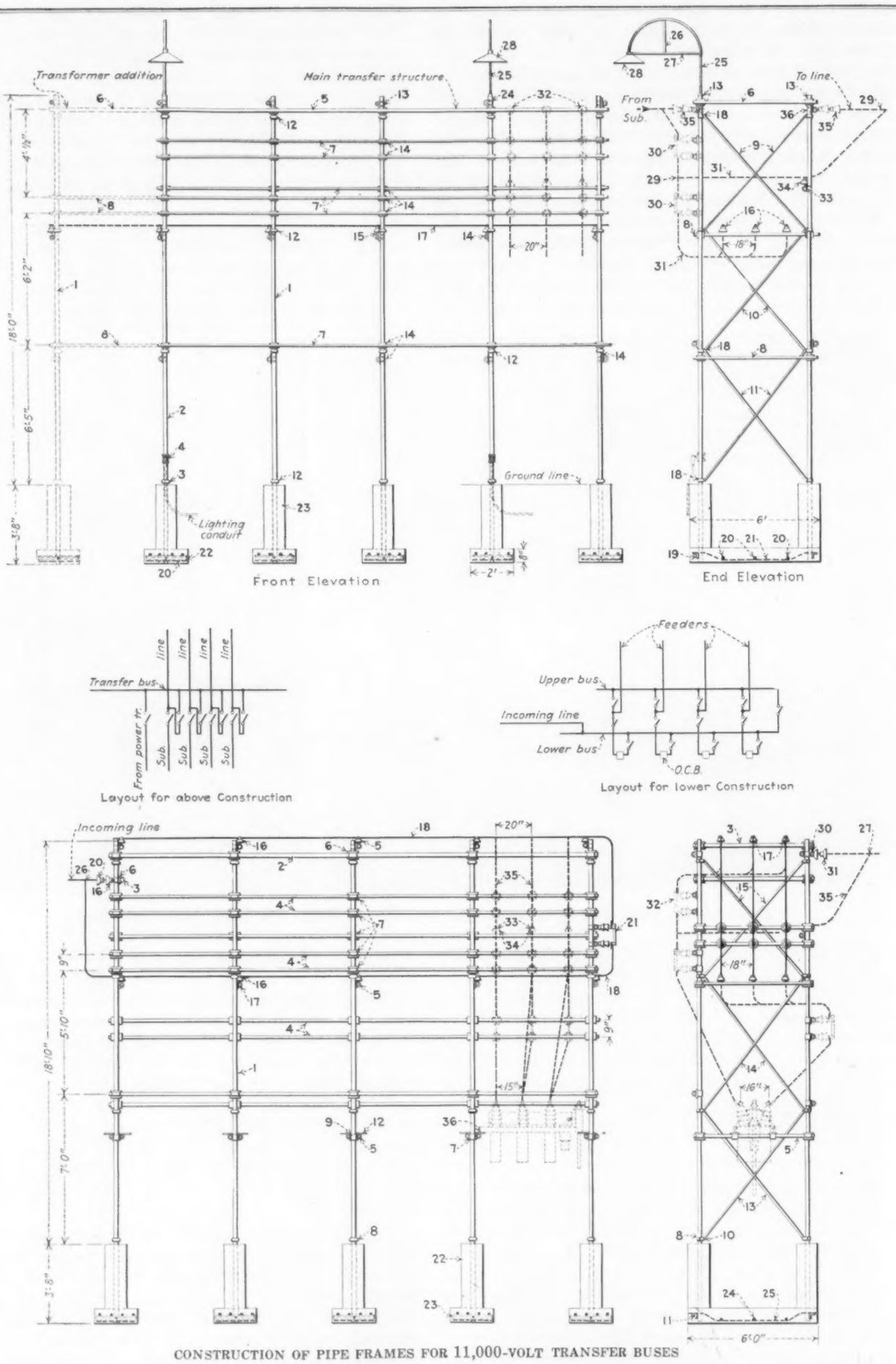
PIPE AND STANDARD FITTINGS MAKE SATISFACTORY STRUCTURES FOR SWITCHING APPARATUS

This is made entirely of standard galvanized pipe connected together with standard clamp-type switchboard fittings. The parts are carried in stock at all times, and a rack can be made up at once to suit any requirement. The cost worked out somewhat less than that for the structural-steel rack. The accompanying table shows the complete bill of material. The structure is designed to stand the pull of three No. 2 copper wires per section for a span of 40 ft. (12 m.) on one side only, and the number of sections or circuits can be increased indefinitely. The fact that there are wires dead-ended to both sides relieves the mechanical stresses until they are practically negligible. A cement-color gray paint is used on all parts, and a very pleasing appearance results. As all switches of one phase are between two of the upright pipes, they provide a safe guide in preventing the operator from opening or closing the wrong disconnecting switches. These pipes can be painted a distinctive color if desired.

The question of suitable lighting so that the switches could be easily operated at night was given consideration. The final result as shown by the drawing is to carry the lighting circuit underground through conduit from the lighting panel inside the building to two or more upright pipes in the structure. Conduit goosenecks are mounted on the top of the upright 2-in. (5-cm.) pipes as shown, and the wires are brought up through the pipes. The result is quite satisfactory, but in a few cases flood lamps have been provided on the substation building, and so placed as to project on the rack.

Many modifications of this transfer rack readily suggest themselves. One which is being used by this company is shown in the lower half of the drawing. In this case a heavy 11,000-volt feeder is being brought to a center of distribution and there broken up into a number of branches. It was desired to protect the branches by automatic switches, which will very likely be made reclosing by some electrical or mechanical device. A second bus and "disconnects" corresponding to the indoor ones in the usual substation were added to the pipe rack, and outdoor-type oil switches were located as shown in the drawing. Such an arrangement could readily take the place of a building entirely at a transformer station, all feeder and disconnecting switches being placed on it and an outdoor metering outfit being installed on the incoming lines, which in that case would be the secondary leads from the transformers.

The San Joaquin Light & Power Corporation has not generally adopted a plan for placing all feeder and metering equipment outdoors, but uses that scheme in isolated cases only. The saving, if any, is small, while the benefits derived from having a small building for housing small equipment are great enough to make it a good investment. Some sort of building would be necessary in any case to house telephone equipment, switching sticks, records, etc., and to provide a place for the operator to stay in case of bad weather, during



CONSTRUCTION OF PIPE FRAMES FOR 11,000-VOLT TRANSFER BUSES

Top—Frame for transfer bus as shown in one-line diagram at left. Bottom—Outdoor distribution frame. Receives energy from an 11,000-volt incoming line and distributes over several feeders as shown in one-line diagram at right. Outdoor oil circuit breakers are employed. A transfer bus also is mounted on the same frame.

MATERIAL REQUIRED FOR OUTDOOR SUBSTATION MADE OF PIPES

This is the four-circuit structure shown in the lower part of the drawing accompanying this article.

Quantity	Material
10 pieces	2-in. galvanized wrought-iron pipe, 22 ft. 6 in. long.
2 pieces	2-in. galvanized wrought-iron pipe, 24 ft. 6 in. long.
1 piece	2-in. galvanized wrought-iron pipe, 5 ft. 6 in. long.
9 pieces	1¼-in. galvanized wrought-iron, 24 ft. 6 in. long.
22 pieces	1¼-in. galvanized wrought-iron pipe, 5 ft. 6 in. long.
12 pieces	E.E.E. U-bolt clamp cross, No. 5190.
89 pieces	E.E.E. U-bolt clamp cross, No. 5189.
40 pieces	E.E.E. clamp T elevis, No. 5147.
20 pieces	⅝x4 in. machine bolts.
40 pieces	½x1½ in. machine bolts.
10 pieces	⅝x3½ in. machine bolts.
10 pieces	¼-in. plate, 3x15 in.
10 pieces	Wrought-iron bar, ¼x1¼ in., 7 ft. 9 in. long.
10 pieces	Wrought-iron bar, ¼x1½ in., 7 ft. 11 in. long.
10 pieces	Wrought-iron bar, ¼x1½ in., 7 ft. 2 in. long.
30 pieces	Locke insulator, No. 6512.
30 pieces	E.E.E. insulator pin, No. 4001.
185 ft.	⅝-in. copper tubing, standard pipe size.
3 ft.	Hook bolts, ⅝x4 in.
6	Thomas insulators, No. 1056.
3	G.E. L-G-7 disconnecting switch pipe mounting.
5	Concrete base, ½ cu.yd. each.
10 pieces	2x2x¼ in. ∟s., 2 ft. 0 in. long.
15 pieces	⅝-in. sq. bars, 2 ft. 0 in. long.
20 pieces	⅝-in. sq. bars, 6 ft. 3 in. long.
3	Dossert connectors.
Wiring material for each feeder circuit:	
3	Hook bolts, ⅝x4 in.
6	Thomas insulators, No. 1056.
9	G.E. L-G-7 disconnecting-switch pipe mounting.
3	Locke insulators, No. 6512.
3	E.E.E. insulators pins, No. 4001.
110 ft.	¾ in. copper tubing, standard pipe size.
4	½x1½-in. machine bolts.
9	Dossert connectors.

which time most distribution trouble is likely to occur. Then, too, feeder switches require more adjustment and maintenance than any others, and a shelter is necessary for such work.

Prices on parts have not been given because these are continually changing. Any one who desires can obtain current prices and make up an estimate for any condition desired from the bill of material.

Industrial Standardization in Germany

Significance of the Movement for Mechanical Uniformity that Is Part of Reconstruction Program—Continental and Anglo-Saxon Methods

INSUFFICIENT attention has been given to the rôle which standardization is playing in German industrial reconstruction. The American Engineering Standards Committee states that the German industries are planning and are carrying out a far-reaching program of standardization as a necessary step in building up an unprecedented industrial structure which must rest in large measure on an extensive foreign trade. According to this committee, in no other country except Great Britain is standardization work being carried on upon a scale or with an intensity comparable to that in Germany.

The American Engineering Standards Committee feels that the German work should be of special interest to those responsible for the management of American industries, not only because of its importance, but also because of the similarity in the historical conditions surrounding the national standardization movements in Germany and in America. Accordingly it has issued monographs on the subject.

Prior to 1917 a vast amount of standardization work had been carried out in Germany by individual companies and by engineering societies and industrial associations, but, as was the case in America before the organization of the American Engineering Standards Committee, the work had not been unified along national lines.

As has been the case with all the other national standardizing bodies except the British, which was organized in 1901, the success of the standardization work carried out by the various countries during the World War as a part of their national conservation programs was a chief cause of the formation of the central German body. It is called the Normenausschuss der Deutschen Industrie and was organized by the Verein Deutscher Ingenieure, at the suggestion of the German government, in 1917. The present membership consists of engineering societies, industrial associations and government ministries, and in addition there are 700 firms that are contributing members. The work of the Normenausschuss deals only with those subjects which concern two or more industries or branches of industries.

It is remarkable that the national standardization movement in Germany should have been so thoroughly organized and that so much work should have been accomplished in four years. One hundred and forty-four approved standards sheets have been issued and more than 500 others have been so far developed that they have been published in tentative form. The standards are issued under the general designation of German Industrial Standards (Deutsche Industrie Normen, usually contracted to "Dinorm"). The Germans were the first of the national bodies to publish standards in loose-leaf form. The work is so divided as to make each sheet as nearly independent as possible. Firms purchase these sheets in quantity, issuing them directly to designers, draftsmen and foremen for use as working drawings and data sheets. (This plan is now followed by the Austrian, Dutch, Swedish and Swiss bodies.) The sale of sheets amounts to about 100,000 monthly.

Organization and Methods of Work

The organization and methods of work are similar to those in other countries. Next to the American Engineering Standards Committee, the German organization is the most decentralized of the national standardizing bodies. There is a main committee composed of representatives of the various national organizations supporting the movement, as well as a smaller executive committee. The detailed technical work of each project is in the hands of a working committee, which in Anglo-Saxon countries would be called a "sectional committee"; that is, a committee made up of representatives of all bodies interested in the particular subject in hand.

Proposals for new subjects for standardization must come from some responsible body. The industry concerned is consulted, generally by a conference of the various organizations interested, to determine whether it is the consensus of opinion that the work should go forward. In case it is decided to undertake the work, the conference designates the chairman of the working committee.

The central office digests the information available on the subject for the use of the working committee. When agreement is reached in the committee on the draft of a standard it goes to the central office for editorial work. There it is scrutinized to see whether it is consistent with other standards, whether points have been included which concern other working committees, whether the drawings and nomenclature are in approved form, etc. After this editorial checking the central office has the draft of the standard put into

proof form. It is then reviewed by an official clearing house committee, which contains a representative from each major line of work being carried on by working committees. If any change in substance has been made, it goes back to the working committee. If no such change has been made, it is published in the *Mitteilungen*, the official publication of the Normenausschuss, as a tentative proposal. Upon recommendation of the working committee, the standard is mailed to the members of the executive committee with a supporting statement. With their approval it is then republished as an official proposal. Six weeks are allowed for criticism when a standard is finally published unless additional important criticisms are received.

Work in Special Industries

The foregoing refers to the work of the central body only, which is limited to subjects common to two or more industries. In addition there are some fifteen organizations known as special industry committees, each of which deals with the standardization work peculiar to a single industry, such as shipbuilding, electrical, agricultural, automotive, elevator, locomotive, paper, textile and woodworking.

These committees are closely affiliated with but are not strictly an organic part of the central body. They are organized not by the Normenausschuss, but by one or more technical or trade associations concerned with the particular subject in hand. Standards formulated by the special industry committees are published by the organization responsible. In most cases the final standards are published in loose-leaf form modeled closely after that of the standards issued by the Normenausschuss itself. These standards are submitted to the Normenausschuss before publication, in order to keep them consistent with the regular series of German industrial standards.

The volume of work being carried out through these special industry committees appears to be at least as great as that under the direct control of the central body.

Looked at broadly and with exceptions such as must always be made in general statements of the kind, the Continental countries are going much further into dimensional standardization than has been done in Anglo-Saxon countries. This includes interchangeability of supplies and of machine elements, the interworking of parts and of related apparatus made by different makers, and the interchangeability, so far as the use is concerned, of complete machines and apparatus. By far the greater part of the work of the Normenausschuss is dimensional, greater attention being paid to such matters as machine elements, screw heads, bolts and nuts, standard diameters and systems of limit gaging. The Anglo-Saxon mind takes more to matters having to do with purchase and contract, such as specifications for materials and for performance of apparatus, methods of test, etc. The Normenausschuss itself has done very little of this type of work as yet, but it has been highly developed by some of the German special industry committees, for example, in the electrical industry.

There is on the Continent a greater dependence upon theoretical and fundamental considerations, the Anglo-Saxon temperament giving rise to a much larger degree of expediency in adjusting commercial considerations in the process of arriving at agreements.

German manufacturers will go farther in yielding apparent temporary commercial advantages for the sake of advancing their national industry as a whole than is the case in America or Great Britain. Three principal reasons for this are the great economic pressure under which German industry is laboring, the mental trait of more readily acquiescing in decisions affecting national welfare, and the belief that an essential to the rehabilitation of German industry is the rebuilding and great enlargement of their export trade, for which the importance of standardization on national lines is more readily apparent than it is in domestic trade.

The Germans have not yet had their standards translated into foreign languages for use in export, as the British are doing, but they are considering doing so.

As typical examples of the German work, their system of "preferred numbers" and their standard series of handles may be mentioned. The first is a fundamental piece of work, founded on theoretical considerations and of the first importance. It is a simple system of numbers for use in all new standardization work, in which gradated numerical values are required, such as standard gradated diameters of pulleys, thicknesses of plates or capacities of machines. The Germans believe that its use is going to lead to great economies in material, in reducing the number of sizes, ranges, etc., to simplify the carrying of stocks and to facilitate interchangeability. It may be shown theoretically that, under average conditions, a given number of standard sizes laid out according to these numbers will be better fitted to any series of jobs taken at random than would be the same number of sizes laid out in any other way, and this with a minimum of material.

The standard handles furnish a typical example of German love of thoroughness of detail. There are two shapes, each adapted to a particular method of use, and there is a series of sizes for each shape. The profiles have been worked out with the most extreme care, an efficiency engineer having been employed to make time-motion studies to determine the exact profile that would insure the greatest accuracy in operation with the minimum fatigue of the workman's hand. It is felt that by doing a thorough job once for all different industries and firms will be saved from doing the same thing over and over, but always less well, and that at the same time interchangeability is introduced.

Industrial Significance

The standardization movement in Germany is particularly significant since Germany is one of the three leading industrial countries. The industries of Austria, Holland, Sweden and Switzerland are so intimately related to those of Germany on account of geographical and other relationships that they are necessarily affected very largely by developments in Germany.

It appears that the work is being woven very intimately into the industrial fabric. The very large number of standards purchased by the industry and the fact that the central organization has 5,000 firms which are co-operating members are a sufficient indication of this. There seems to be a striking analogy between the present standardization movement in Germany and the research movement developed there a generation ago. Whatever estimate one may place upon the rôle it played in German industries generally, every one agrees that research was fundamental in the development of the great German chemical industries. The rôle which the Germans are expecting standardization to play in all their industries would be not unlike the rôle which research has played in their chemical work.

Letters from Our Readers

This is a readers' forum. Comments on questions before the electrical industry presenting economic, financial, engineering or commercial aspects and new or supplementary viewpoints on published articles are cordially invited

Explaining the Kilowatt-Hour

To the Editors of the ELECTRICAL WORLD:

The writer was very much interested in reading your editorial comment of Sept. 24 entitled "Put the Kilowatt-hour in Its Place." In a recent talk before the Purchasing Agents' Association of Northern California he had the following to say about the kilowatt-hour:

There are very few commodities which the average man pays for that he knows so little about as he does about the kilowatt-hour, and yet there is no commodity of any nature that he buys that is so definite in character as the kilowatt-hour.

The early inventors of the steam engine turned to things familiar in their selection of a unit of power, and by actual experiment they determined the amount of work done by the English dray horses of that period and called the average amount of work done by one of these animals a horsepower. Unfortunately, the kilowatt-hour does not visualize for us such a concrete picture of power, but when we consider that a kilowatt-hour is 1⅓ horsepower it will bring before us a mental picture of what we are buying. The horsepower is defined as the amount of work which is done in lifting a weight of 33,000 lb. through a distance of one foot in one minute. The kilowatt is, therefore, the amount of work done in lifting a weight of 44,000 lb. through one foot in one minute, or the work done in lifting 440 lb. through a height of a hundred feet in one minute.

Now, if we put the kilowatt to work for one hour instead of one minute, it will have the power to lift 26,400 lb. to a height of 100 ft. If we allow a 25 per cent loss in the motor and the elevating machinery, the kilowatt-hour still has sufficient power actually to hoist 200 100-lb. sacks of flour from the basement to the eighth floor of a flour mill or to lift 2,800 50-lb. lugs of fruit from the first to the second floor of a warehouse.

And now, gentlemen, when you stop and consider that your respective companies pay about 1½ cents for the kilowatt-hour we have just been talking about, I claim that they are getting something for their money.

Your Mr. Gray's company at Crockett handles 1,200 tons of raw sugar in and 1,000 tons of refined sugar out every twenty-four hours on a belt conveyor 700 ft. in length extending between its mill and its warehouse. The actual energy used by this belt costs his company about $4.80 per day. I have figured out that it would take about ten 3-ton trucks working two ten-hour shifts to do the same work, and instead of costing this sugar company $4.80 per day it would cost it at least $600.

The writer feels that it would be a very difficult thing, and perhaps an injudicious thing, to attempt to change the rate schedule from the point of view of eliminating the kilowatt-hour, because the kilowatt-hour is now basically interwoven with other units in the complex fabric of the electrical industry as a whole. He therefore suggests that, instead of attempting to eliminate the kilowatt-hour, the whole industry unite to interpret the kilowatt-hour to the purchaser by means of such simple illustrations as the one shown in the above quotation. This can be done both through the medium of public talks to representative bodies in the industrial organizations and through the wider medium of the press.

The writer has found from his own experience that entirely too much stress is laid upon the mysterious phases of electricity by men within the industry, and they have failed to convey the simple truth to the purchaser that, as far as electricity is concerned, it is one of the most simple and dependable forms of energy.

L. F. LEUREY,
San Francisco, Cal. Practicing Engineer.

All Reserve Funds Should Be Reinvested in Property

To the Editors of the ELECTRICAL WORLD:

Your editorial of Oct. 8, "Injustice of Large Cash Depreciation Funds," emphasizes the need for a clearer understanding of the principles involved in accounting for replacements due to depreciation of parts of a public utility property.

Each unit or item of physical property eventually reaches a point where owing to decay, wear, obsolescence or inadequacy it is no longer useful and must be abandoned or replaced. Each such item represents a certain investment which must be accounted for when the unit is abandoned. These facts were recognized in the beginning of rate regulation, and commissions and courts have included an allowance for "replacement" or "depreciation annuity" as an operating expense item in almost all rate-making decisions. It is the almost universal practice to base these annuities on assumed average lives for various classes of equipment. The tendency is to overestimate rather than to underestimate these average lives. This is due to the fact that improvements in design or changes on account of growth make it economy to abandon most items of equipment long before they are worn out in service. A very typical case is that of one of the smaller electric companies which since its beginning in 1890 has abandoned in order a direct-current system, a single-phase system, an installation of engine-driven polyphase generators and one of turbo-generators and is now operating machines which could be junked with economy except that they are used only for peak-load service.

The workings of a practical replacement reserve account in use by one utility is as follows: Average lives are assigned to classes of items corresponding as far as possible with the classification of accounts, and an annuity based on these lives with compound interest is set up for each group. A charge is made to operating expense and a credit to the fund at the end of each year. All items of property abandoned or replaced are charged to the fund and credited to capital. All new items, whether replacing others or not, are charged to capital at actual cost. The reserve is not held in cash but used for mortgage sinking funds to repurchase bonds of the company and for extensions and additions to property.

The total reserve fund at any time, if properly calculated, represents the progress of the total investment toward extinction due to the decay, wear and tear, and obsolescence of the items of physical property which represent it. In other words, it is the total amount which the utility should have earned, on account of depreciation, to maintain the investment intact.

Such reserves properly accounted for have two very important uses—first, to enable regulatory authorities to allow utilities to earn sufficient to maintain their investment intact in addition to earning a return; second, to insure that the allowance for this purpose

is used to retire securities or extend the system. In other words, it remains in the business and is not paid out to present stockholders at the expense of future stockholders.

The failure of many utilities to earn fixed charges today is due to the fact that they did not or could not in earlier years maintain their investment by means of replacement funds.

A large utility which has ceased to grow and has come to the limit of improvement will eventually reach a stage where the annual total of abandoned and replaced property will be quite uniform. However, with utilities where growth and improvement is as rapid as it is with our electric utilities today, any attempt to base the annuities on current replacement experience is bound to result in allowances very much under what the companies are entitled to if their investment is to be maintained out of earnings, as it must be if they are to remain prosperous.

It should not be difficult to safeguard the reserve to the satisfaction of the commission without maintaining it in cash. In these days of difficult and costly borrowing coupled with large expansion requirements, all reserve or other excess funds not liable to sudden call should be reinvested in the property, and this is particularly true of depreciation or replacement reserves whose sole final purpose is to maintain the investment made by the owners.

G. R. KENNY.

East Orange, N. J.

Electrically Heated Steam Boilers Prove Successful in Sweden

To the Editors of the ELECTRICAL WORLD:

Although an electrically heated steam boiler appears at first sight to be economically an utterly hopeless proposition, nevertheless, in places where there is access to what may be termed "spillway power" from hydro-electric stations, and even in certain other cases, the electric steam boiler may be used to good advantage, as is shown by several successful experiments reported from Sweden.

The most important electric boiler plant in Sweden was put in operation last year at the pulp and paper mills at Vargön. This plant consists of steam boilers, each of 3,000 hp., which are fed at 10,000 volts directly. The Vargön mills are thoroughly electrified and are supplied from the hydro-electric station at Trollhättan. The steam from the electric boilers is used for various heating processes, and economically the electrification of the boilers was made possible by the Trollhättan plant being able to give up considerable amounts of night and off-peak energy at reduced rates.

In another category come plants where electric heating is used to keep steam boilers in preparedness for emergencies. In the municipal power station at Jönköping, for instance, the old steam-electric generating plant is maintained as a stand-by, while normally the power demand of the city is cared for by a hydraulic station at Huskvarna. Two of the boilers, however, have been provided with resistance heaters, and during seasons of frequent disturbance are continually kept under full steam pressure, ready to take up full load in a few minutes. The boilers being well insulated thermally, the energy loss is rather insignificant.

An auxiliary electric steam boiler used for somewhat different purposes has been in operation for a few years in the state steam-electric power plant at Västeräs, Sweden, and has proved to be an economical success, it being estimated that every kilowatt-hour put into the boiler serves about 3 öre—or more than half a cent—in fuel, while the power cost is considerably less. The boiler is designed by N. Forssblad and built for 1,000 kw. and a steam pressure of 15 kg. per sq.cm. (213 lb. per sq.in.), the power being applied at 6,300 volts, directly in the water. The boiler has three tight bushings, insulating for this voltage, and the power may be regulated in the ratio of one to two by simply turning a handwheel. The Västeräs plant is a reserve and peak station connected to the state power system in middle Sweden, but the station during a great part of the year is used almost exclusively as a synchronous-condenser plant for voltage regulation. During this period much time and money is saved by using the Forssblad boiler to generate the steam needed for "cooling of the turbines." Steam from this boiler also is used for various other purposes, tests, etc., and during the stormy season one of the ordinary boilers is kept in preparedness by a so-called silent boiler placed at its lowest point and fed by steam from the electric boiler. Oil burners are installed in the boiler, which is thus preheated, and it is therefore capable of picking up full load almost instantaneously.

Among central-station men electrically heated steam boilers are rather popular owing to their good power factor and load factor. It is probable that the electrically heated steam boiler, in connection with the Ruuths vapor accumulator, will be of importance in providing a simple means of utilizing "spillway power" by storing the energy during the night for use next day.

Stockholm, Sweden. EDY VELANDER.

Electric Heat Used in Boiling Linseed Oil

To the Editors of the ELECTRICAL WORLD:

Difficulties, disastrous fires and explosions have occurred in many cases when boiling linseed oil, especially when it is used for the production of linoleums and oilcloth. The engineers of our company have completed both the installation and the test of a new boiling method using electric heat. This process, besides doing away with the distinct disadvantages of the old method, has made possible complete heat and chemical control over the very wide range of temperatures involved.

This installation was made at the works of the Armstrong Cork Company, linoleum section, Lancaster, Pa. It is of considerable size, having a connected load of 75 kw. and handling batches of 2 tons of material at each heat. In approaching the problem it was necessary to consider the inherent characteristics of linseed oil to build up heat within itself during the oxidation period, as well as the fact that viscosity changes materially within a very low degree Fahrenheit range, making definite and exacting control obligatory. The heating method applied is indirect, and therefore the temperature of the ribbon is considerably higher than that desired in the oil. This necessitated the installation of a special cooling system to reduce the exterior heat to the normal oil requirement when stopping the furnace to hold for processing.

General Electric heating units and Leed & Northrup control are used, while the main furnace body and appliances for operation were constructed at the Lancaster Iron Works, which are associated with our company.

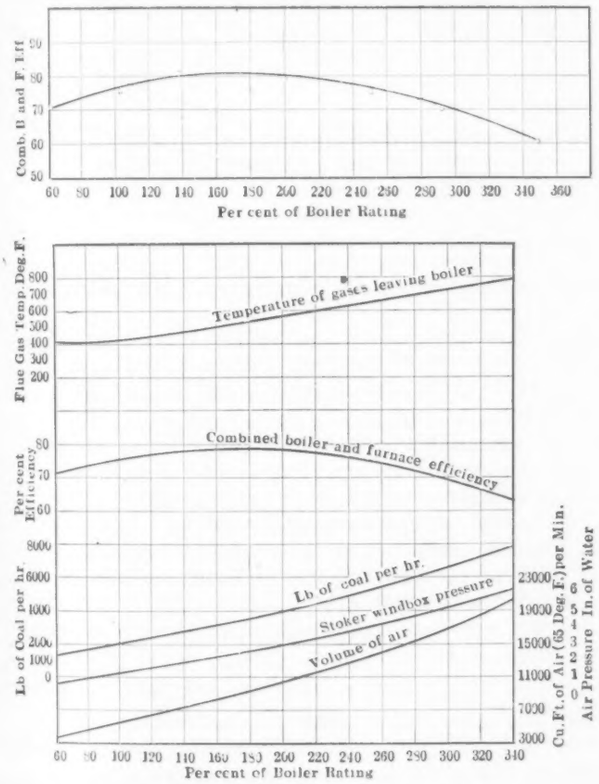
F. J. Ryan & Company, Philadelphia, Pa. F. J. RYAN, President.

Industrial and Station Practice

Installation, Operation and Maintenance of
Generating and Distribution Equipment and Economical Utilization of Electrical Energy
in Mills and Factories, Including Testing and Repair Methods

Test Shows Flexibility of New Stokers

FLEXIBILITY of a new stoker operating at a range of 60 per cent to 350 per cent of normal boiler rating is shown by the accompanying curves plotted from a test performance. The test was made on a 6,000-sq.ft. water-tube boiler on which the fire had been banked previously for four hours, with the boiler developing only about 10 per cent of normal rating. Within one minute after the heavy load was placed on the boiler it was developing normal rating; within two minutes it was developing 200 per cent of rating, and within four minutes 300 per cent. Two types of this furnace are made. One of these, a single-retort, side-cleaning stoker, is intended for boilers up to 3,000 sq.ft. or 4,000 sq.ft. of heating surface; the other is of the multiple-retort end-cleaning type for larger installations. Among the principal features may be noted a level fuel bed, adjustable rams, auxiliary pushers with independent adjustment, hand-operated end dump, adjustable air intake under the stoker, and adjustable air admission over the fuel bed through ports in the front wall.


Comb. B and F. Eff
Per cent of Boiler Rating
Flue Gas Temp. Deg. F.
Temperature of gases leaving boiler
Per cent Efficiency
Combined boiler and furnace efficiency
Lb of Coal per hr.
Lb of coal per hr.
Stoker windbox pressure
Volume of air
Cu. Ft. of Air (65 Deg. F.) per Min.
Air Pressure In. of Water
Per cent of Boiler Rating

PERFORMANCE OF BOILER AND NEW STOKER
Upper chart shows record of tests. Lower chart was calculated.

Retorts and tuyères have been designed to operate at comparatively low air pressures and have been arranged to minimize clinker formation. The air admitted through the tuyères is forced through the fuel bed at right angles to the retorts so that the major portion of the fly ash and soot is kept in the stoker furnace chamber and not deposited in the front bank of boiler tubes. Side-wall tuyères extend above the retorts and protect the brickwork from the clinker formation.

EDWIN FITTS.
Detroit Stoker Company,
Detroit, Mich.

Every Accident Teaches a Lesson

SOME practical lessons in the design and operation of hydro-electric plants should be gleaned from the observations which were made during and following a recent penstock accident where the plant involved operated under a 680-ft. head. The penstock had been subjected to both shop and field tests. At the time of the accident the plant was being subjected to a preliminary try-out, operating without any forebay or surge chamber. Construction of that feature had not been completed, and a bypass or temporary direct connection was being used between the supply tunnel and the 2,800-ft. penstock which fed the plant. This bypass consisted of 150 ft. of pipe having only three-quarters the diameter of the penstock supplied and unfortunately was connected with it at a point not much below the hydraulic grade line. The upper part of the penstock, which was 8 ft. in diameter, contained a 6-in. air vent.

As nearly as the facts can be established from data now available, a short circuit occurred just before the accident, causing a big withdrawal of water from the penstock and apparently breaking the water column below the construction formed by the temporary forebay bypass. Upon clearance of the short circuit the gates closed, retaining what water remained in the penstock as a solid front to the trailing water column. Although there are no data to indicate the force of the impact with which the two columns of water met, it is quite easy to imagine that the trailing column of water must have acquired an enormous momentum in rushing almost unrestrained through the long penstock. At any rate, the weakest part of the penstock in the vicinity of the impact, namely, a cast-iron manhole frame about 200 ft. above the power house, failed, starting a circumferential and longitudinal rip in the penstock itself. Although there were welded seams, they did not fail, which is excellent testimony to their strength.

In general, the following conclusions might be made: Before subjecting a new plant to a try-out it should be protected by all the safeguards that it will have in finished form. In this case the safeguard which was lacking was the forebay. Its absence was accentuated by the bypass which had smaller cross-section than the penstock supplied. This was particularly unfortunate because the bypass section was not under much if any hydraulic pressure. It would also appear that a 6-in. vent on an 8-ft. penstock was entirely too small.

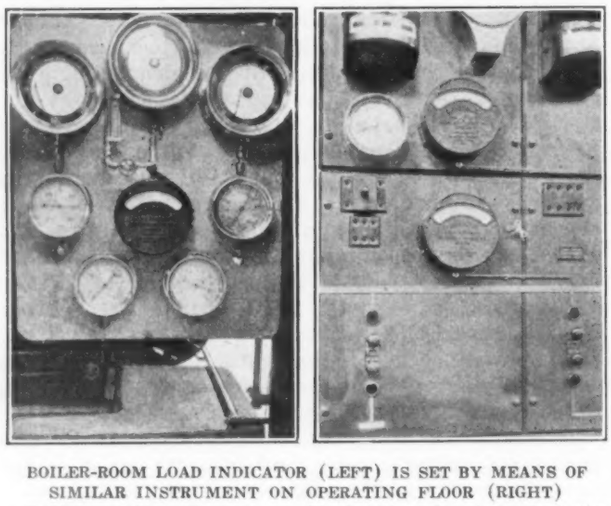
While some weakest spot had to fail, the fact that a cast-iron manhole frame ruptured raises a question whether castings liable to accidental impacts should not be made extra heavy, or possibly whether steel forgings should not be used where the stresses that may be encountered are extreme. From an operating point of view it seems obvious that no high-head wheel should be tested until its governor has been set so that there will be no danger of breaking the water column in the penstocks and, furthermore, so that the water column cannot be retarded so rapidly as to cause dangerous pressures. FIELD EDITOR ELECTRICAL WORLD.

San Francisco, Cal.

Load-Indicating Instruments Facilitate Operation in Boiler Room

FOR the purpose of speeding up power-house operation and improving its reliability, instruments for indicating to the boiler room the kilowatt load carried have been adapted for the plants of the San Joaquin Light & Power Corporation. For indicating the generator load to the firemen an indicating watt-meter in the boiler room is a very useful adjunct, and one is being installed in the company's new plant near Button Willow, Cal. Another instrument for the boiler room is shown in the accompanying photographs, which illustrate an interesting application of a standard Bristol long-distance indicating outfit, consisting of indicators in the boiler room which are set from the operating room.

In this particular instance such an installation was more feasible than installing wattmeters, although the cost was about the same. The scales of the instruments are calibrated in kilowatts, and when the operator sets the transmitting instrument to correspond to the load the receiving instrument in the boiler room takes a similar position. Since this plant is a "block-load" plant, the operator is not particularly burdened in setting the transmitter for different loads. The scheme works perfectly and has proved very useful.



BOILER-ROOM LOAD INDICATOR (LEFT) IS SET BY MEANS OF SIMILAR INSTRUMENT ON OPERATING FLOOR (RIGHT)

Operator sets instrument on his board and pointer in boiler room takes same position.

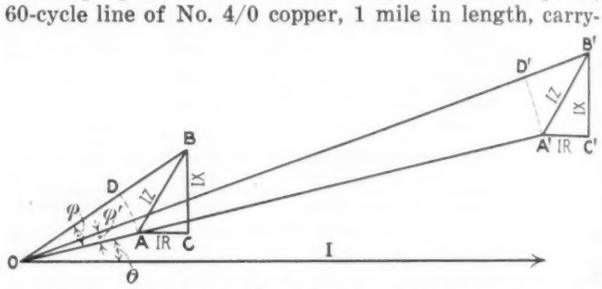
In the hydro-electric plants the floorman or pitman generally has an indication of the load on the unit by the amount of gate opening, which is also generally indicated at the governor head where the floorman can observe it. This virtually obviates the use of special indicating instruments in the hydro plants. From results so far obtained there is no doubt that these devices save much time in power-house operation and at the same time improve reliability and efficiency.

San Joaquin Light & Power Corp., R. C. DENNY,
Fresno, Cal. Operating Engineer.

Possible Errors Through Use of Line Data

TABLES and curves are often prepared for quick reference in obtaining the amount of line drop, owing to a given current passing over a power line of known length and size of conductors. Such data are used in some cases over a wide range of voltages, generally 100 to 6,600. The following examples and vector diagram will show the possible inaccuracy that may arise from using data at any other voltage than that for which it was computed.

For purposes of calculation consider a three-phase, 60-cycle line of No. 4/0 copper, 1 mile in length, carrying 100 amp. at a receiving voltage of 2,200 and a load power factor of 95 per cent lagging. Then:



VOLTAGE DROPS ON SAME LINE WITH DIFFERENT LINE VOLTAGES

$$E = \sqrt{(E' \cos\theta + RI)^2 + (E' \sin\theta + XI)^2},$$

in which:

E = generator voltage from conductor to neutral,
E' = receiving voltage from conductor to neutral,
I = current per phase,
θ = angle of lag between E' and I,
R = the resistance of one conductor per mile,
X = the reactance of one conductor per mile.

E' in this case, will equal 2,200 ÷ 1.732 or 1,270 volts. Substituting the values assumed for the line constants:

$$E = \sqrt{(1{,}270 \times 0.95 + 0.53 \times 100)^2 + (1{,}270 \times 0.312 + 0.56 \times 100)^2} = \sqrt{1{,}259.5^2 + 452^2} = \sqrt{1{,}586{,}343 + 204{,}304} = 1{,}338 \text{ volts.}$$

Or 1,338 × 1.732 = 2,318 volts between conductors. Then 2,318 — 2,200 = 118 volts drop per mile.

If calculations are made for a receiving voltage of 173, there results:

$$E = \sqrt{(100 \times 0.95 + 0.53 \times 100)^2 + (100 \times 0.312 + 0.56 \times 100)^2} = \sqrt{148^2 + 87.2^2} = \sqrt{21{,}904 + 7{,}604} = 171.8 \text{ volts.}$$

Or 171.8 × 1.732 = 298 volts between conductors. Then 298 — 173 = 125 volts drop.

Everything in the two examples given was the same except the voltages, and yet the drop per mile of line was 7 volts greater with one voltage than with the other. It is evident that the error in using data computed for 2,200 volts on lines carrying 173 volts would be too great for any except the roughest computations. The reason for the difference in line drop for changes in voltage is best shown graphically. In the accompanying figure the lower receiving voltage is represented by OA, and the higher receiving voltage by OA'. As IR and IX are the same for both voltages, the tri-

angles ABC and $A'B'C'$ are constructed equal in all their parts. In the triangles OBA and $OB'A'$, angle OAB equals angle $OA'B'$; also AB equals $A'B'$, and the sum of the interior angles of each triangle equal 180 deg. Therefore as ϕ is greater than ϕ', the angle $D'B'A'$ is greater than angle DAB and DB is greater than $D'B'$. As DB and $D'B'$ represent in magnitude and direction the drop in voltage caused by the current I, first at the lower voltage OA, and second at the greater voltage OA', the drop BD for the lesser voltage has been shown to be the greater. It will be seen that if the power factor at the receiving end had been such that IZ and OA fell in the same straight line, the voltage drops DB and $D'B'$ would have been the same for any voltage whatsoever.

In other words, the error in using data or tables for different voltages changes for different power factors, and the error becomes nil when the value X/R happens to equal the tangent of the angle θ. It is when the above condition occurs that we have the greatest possible line drop, for OAB then becomes a straight line, and DB, the drop, equals IZ, the impedance. W. S. GUTHRIE.
Anaconda Copper Mining Company,
Butte, Mont.

Individual Condensers at Motor for Reducing Power-Factor Loss

CAREFUL selection of motor sizes is naturally the first step in obtaining high power factor, but there are cases where a motor must operate for a good part of the time at low load and consequently low power factor. As a means for correcting power factor in such cases an individual type of condenser has been developed for application at the terminals of each motor which has low power factor. An advantage of this method of installation lies in the fact that the low power factor is corrected at the place where it is produced and all line losses due to it are eliminated. The internal losses in the condenser itself are less than one-half of 1 per cent so that the only cost of the correction to the consumer is the interest on the first cost of the condenser and virtually the entire possible saving in current is actually obtained.

SIZES AND WEIGHTS OF INDIVIDUAL CONDENSERS OF VARIOUS CAPACITIES

Capacity (Kva.)	Service Voltage	Test Voltage	Dimensions Approximate (In.)	Weight Approximate (Lb.)
		SINGLE-PHASE CONDENSERS		
¼	220	800	6.75x9.5 x1.44	4.375
½	220	800	6.75x9.64x2.88	8.75
1	220	800	6.75x9.69x5.75	17.5
1	440	1,500	6.75x9.69x [illegible].44	5.0
2	440	1,500	6.75x9.69x2.88	10.5
		THREE-PHASE CONDENSERS		
¼	220	800	6.75x9.5 x1.6	5.0
½	220	800	6.75x9.5 x3.25	10.0
1	220	800	6.75x9.5 x6.5	20.0
1	440	1,500	6.75x9.5 x1.44	5.0
2	440	1,500	6.75x9.5 x2.88	10.0

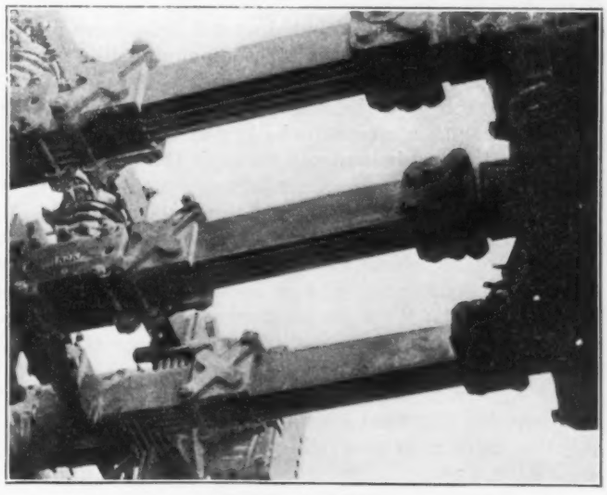
An advantage lies in the fact that where a number of motors have low power factor the investment necessary for the correction of all does not have to be made at one time but can be made gradually as convenient, the worst cases being picked first.

An induction motor on a circuit whose power factor is below a certain point will not carry its full load owing to the dropping of its breakdown point. This is an excuse often used for overmotoring that might be eliminated by the installation of individual condensers. It is obvious that a group installation of condensers at the consumer's meter, while correcting the objections of a low power factor from the standpoint of the company furnishing the electric service, may not raise the service power factor at any individual motor to a point that enables it to carry the load for which it is designed.

Weights and sizes of condenser units made by one manufacturer are shown in the accompanying table. They are made in sizes of ¼ kva. to 2 kva. in single-phase and three-phase types. The units can be combined into a battery of any capacity desired. J. L. MERRILL.
National Electric Condenser Company,
Philadelphia, Pa.

Bus Construction for Heavy Low-Voltage Alternating Currents

A LOW-VOLTAGE bus system for carrying considerable power presents a number of difficulties both from the construction and the operating standpoint. The cost is excessive and much of the equipment is of a highly special nature. The heating of the bus and the magnetic effects of such currents must be considered very carefully or trouble will be encountered. The skin effect in the customary construction of laminated busbars renders a bus of five ¼-in. x 5-in. bars about the maximum for economically utilizing the copper. The eddy currents will cause undue heating if thicker or wider bars are used. The addition of more bars adds little to the current-carrying capacity as determined by the heating. Better results will be attained by splitting the bars into two or more sets. Switching equipment for heavy currents requires considerable floor space; thus the bus will be spread considerably more than with a similar amount of power at a higher voltage. If advantage is taken of this point and the feeder switches are arranged in several rows, each with a separate bus, many of the troubles can be eliminated, as the current in each bus can be kept to a reasonable amount.



DROP-OUT LINKS FOR DISCONNECTING BUS SYSTEM

The supporting structures must be very rigid as the weight of the copper is quite considerable and the stresses in case of short circuit are enormous. Great care should be taken to insure clean surfaces and as nearly a perfect fit as possible at all joints. Many of the bus clamps on the market are too light for this

class of service and will bow in the center if drawn too tightly. This brings all the contact on the edges of the bars and will cause heating.

The use of even one iron clamp and iron bolts with such currents will add considerably to the heating even though they do not completely inclose the bus. Iron supporting structures will heat to a remarkable degree. The heating from the induced currents in building steel 2 ft. or 3 ft. from the bus is readily noticed. Extra-heavy brass pipe substituted for the iron pipe supports must be insulated at the joints to break up the currents which will circulate through them. The heating effect in the reinforcing rods of concrete floors is sometimes sufficient to cause a sag in the floor. These effects are most noticeable where the buses are brought together for metering. If the bus system is divided into several bus circuits the individual induced magnetic circuits are not so strong and these effects can be minimized. Metering can be accomplished by totaling the individual meters on each bus or by paralleling the current transformers of the various branches of the bus on the secondary side and measuring the combined current on the meters. Either method will avoid the concentration of magnetic fields.

Disconnecting switches between the buses and the oil switches are a necessity for proper inspection and repair. In the larger sizes they are a frequent source of trouble from overheating. Unless operated frequently they gradually become coated with a film of oxide. Once this film is started it will spread very rapidly. The action is cumulative and the heat will rise till the jaws lose their spring temper. The usual remedy for such trouble is to attach carpenter's parallel clamps, and in plants using heavy currents such clamps are kept handy. If the trouble is detected in time it may be remedied by grinding the switch with a fine grade of valve compound.

In a recent installation of 2,000-amp. and 3,000-amp. switches for this class of service the disconnecting switches were eliminated but drop-out links were placed in the bus connections as the accompanying illustration shows. These links were made to serve the purpose of the disconnecting switches, but were clamped in the same manner as a splice in the bus except that one end was drilled and a bolt placed through the center of the joint. This allows greater contact pressure at the joint than can be attained with the disconnecting switch. It also simplified the bus design considerably. A switch of this size is seldom opened except for inspection or repairs to equipment, and a competent electrician is usually present. With the clearances allowed the loosening of the clamps does not present any great hazard if done by a properly qualified man.

For higher voltages and for currents of less than 500 amp. the standard disconnecting switches will probably be more safe and will not usually give trouble.

El Paso, Tex. T. H. ARNOLD.

Tripping Out Motor Automatically at Certain Time

IT OFTEN happens that a motor in some isolated place runs for several hours or even for a few days, at the end of which time a special trip has to be made to shut it down. Where conditions do not warrant the expense of standard automatic time apparatus for performing this function a trip can sometimes be saved by a very simple time relay that costs practically nothing and can be relied upon to act within a few per cent of the desired time to shut down the motor, whether it be one hour from starting or several days. Practically all starters have a holding coil in series with a resistance tube in such a way that when the holding coil is short circuited the starter trips, disconnecting the motor from the line. Therefore all that is necessary is some device that will close a circuit shunting this tripping or no-voltage release coil at the end of the time desired to shut the motor down.

A piece of ordinary soldering wire held by one end in a horizontal position may be used for this purpose as it will bend down gradually and act as a short-circuiting switch. A test showed that a piece of such wire about $\frac{1}{8}$ in. in diameter and 6 in. long would yield under its own weight about 1 in. in eighteen hours and 3 in. in about eighty-five hours. This time is about the same for any sample of the same wire, though it might be different for different compositions. A little experimenting on any particular size of solder wire will give the length best suited for a certain case. After that nothing is required except to arrange it so in the circuit that the end as it sags down will make contact and complete the circuit. PHILIP G. BERNHOLZ.

East Orange, N. J.

Cleaning Commutator Bars

IN ELECTRICAL repair shops it is often necessary to re-mica commutators, *i.e.*, put in new mica segments between bars. In doing this the old mica and shellac must be removed from the bars, which must be left thoroughly clean. The old method was to knock the commutator apart, scrape off the mica with a knife and then put the bars against a garnet-paper wheel to remove the shellac and particles of mica adhering to the bars. In nine cases out of ten the wheel removes considerable copper in spots before all the old residue is removed. This method does not make a satisfactory job and, moreover, it takes considerable time.

The following method has been found to save time and shows a decided improvement in the quality of the work. The commutator is knocked apart *i.e.*, the individual bars are separated by hitting the commutator with a mallet. No attention is paid to the mica adhering to the bars except to gage the thickness of one or two samples, but as each bar is separated from the assembled commutator it is dropped into a wire mesh basket, mica and all. When the whole commutator has been knocked down, the basket is suspended in a tank containing a boiling Wyndotte solution and allowed to remain there from three to five hours, depending upon the size of the bars and the number. A tank of any size, such as an old water pail or clothes boiler, will do, provided that the bars are kept away from the bottom. After the boiling the basket is removed and the contents are emptied onto a flat draining surface, when a stream of clean cold water is turned on the bars, which washes away all particles of mica flakes, leaving the bars clean and bright as new. If desired, instead of turning a hose on the spilled-out bars, place the basket in a pail containing clean cold water and remove one bar at a time, shaking the bar while under water to remove the mica flakes.

If the commutator bars do not have risers but have a slot cut for the wires, the armature is stripped by chopping off the leads back of the commutator with a cold chisel and the old wire is allowed to remain in the bar

until the commutator has been completely re-micaed. Then it is put in the miller and the necks are milled out.

With the bars that have risers the procedure is to clean in the way already described. Tin the risers by dipping in hot solder. After cutting the mica dip the complete bar in clean shellac, place the bar on a mica segment and allow it to dry. Then trim the mica to fit the bar with a knife and a knife file. The bar with the riser is tinned before applying the mica because with this type of bar the mica does not extend up to the tinned section, hence the part will not get covered with shellac. On the other hand, if the old wires in the low-neck type were cleaned out and the bars dipped in shellac, it would interfere with the soldering.

Dipping the bar instead of painting the shellac on the mica segment has the advantage that when the commutator is heated for the final setting and tightening the shellac will soften and cause the mica to adhere to both sides of the bar, and it is also a quicker method.

The cleaning process requires very little time and attention and can be done by the average shop helper.

Detroit, Mich. A. C. ROE.

Alternating-Current Motor-Control Apparatus for Shop Service

PROPER choice of control apparatus for motors used in industrial applications is one which requires personal knowledge of the different operations effected by these machines. Many purchasers take standard control with whatever motor they buy and find on installation that it is not so satisfactory as they would like to have it. While standard control may be satisfactory in the majority of cases, there are many cases where it would be a great advantage to production and safety to use special equipment.

Many engineers make the mistake of putting on control apparatus without considering the man running the machine. The writer very seldom completes an equipment without talking with the foreman of the room in which the machine is installed, and on a change-over job with the man who operates the machine. They know which is the handiest place for the control, and if it is found that the control will work just as satisfactorily in the place they suggest, it is placed there.

When machines are started and stopped at infrequent intervals and there is no danger to the operator from the machine, the simplest control is the most satisfactory and will require the least attention. For small motors from 7½ hp. down, where there is no heavy starting torque, we use hand-operated oil switches, with all parts totally inclosed and equipped with overload relays. These are further protected with fuses where the line is tapped on the main line. If repairs are necessary on the oil switch, the fuses are removed, which kills the line and the switch.

We have a number of machines equipped with motors from 3 hp. to 10 hp. on which it is impossible to put a large switch or control, either because the machine is continuously in motion, swinging back and forth—for example, polishing lathes—or because the machine is so small that there is no room for large control. On these machines we use remote control, mounted on the wall or overhead, with a push-button on the machine. On the polishing lathes this method is far ahead of any other because the operator uses both hands to operate his machine when polishing and one hand to steady it while shutting down or starting up. The push-button is placed in such a position that he can raise one finger from the machines and stop or start it at will. The cost is practically double the standard control, but the convenience and flexibility and the good will of the operator offset this many times.

The choice of control for motors of from 10 hp. to 25 hp. inclusive depends largely on local conditions. Where there is no heavy starting current required and only one speed, we use a squirrel-cage motor with compensator and a totally inclosed safety switch. This we mount on the machine, if there is room; if not, on the wall nearby. Sometimes, when conditions require it, if the control is on the wall, we run a line from the trip coil of the compensator to the machine and mount a snap switch on the machine so that it can be stopped quickly.

In many localities the power company will not allow squirrel-cage motors of over 25 hp. to be used. In this case the only solution is the slip-ring motor with which we use drum control, either with a safety inclosed switch or with an oil switch, depending on conditions of the individual installations.

On all motors over 50 hp. it is good policy to use oil switches for safety. An operator sometimes, when excited, may pull out a switch carrying a heavy load before throwing back his controller, and draw an arc heavy enough to short-circuit his switch. With a plain switch he is liable to get badly burned, besides ruining his switch. With the oil switch he is safe, as the oil will quench the arc.

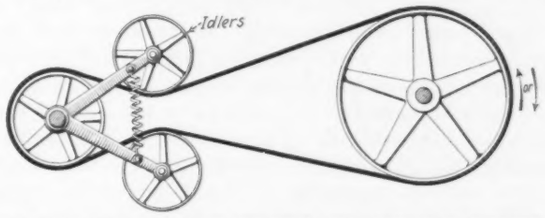
The larger the motor, the more foolproof should be the control apparatus, under ordinary conditions. It is poor economy to buy a large expensive motor and try to save by putting on cheap control equipment. One mistake may cost many times more than one saves in control.

L. N. BURHOE,
Electrical Engineer.

Seymour Manufacturing Company,
Seymour, Conn.

Idlers for Increasing Belt Contact on Small Driving Pulley

IN THE Aug. 6 issue of the ELECTRICAL WORLD, page 273, E. L. Bragdon tells how lost motion was taken up in a waterwheel control. His scheme seems very practical and evidently original, but the writer would suggest as an improvement that the idler pulleys be of generous diameter to reduce the bearing speed and that they bear on the outside of the belt, thus closing



IDLERS TAKE UP SLACK OF BELT AND INCREASE LENGTH OF CONTACT WITH PULLEY

it about the smaller pulley instead of opening the belt, which reduces the arc of contact. A further improvement could be introduced by making each of the idler arms independent and drawing them together with a coiled spring which would take up the continued slack of the belt.

H. S. RICH.

Little River, Conn.

Management and Policy

Embracing Central Station Commercial Organization and Management, Customer and Trade Relationships, Public and Financial Policies, Advertising, Selling and Service Methods

Electrical Men Themselves Must Use Appliances

A Frank Criticism from an Address by F. J. Allen, Chairman Merchandising Committee New England Section, N. E. L. A.

THE most serious condition which faces the commercial branch of the electrical industry today is the undisputed fact that we are not functioning properly as merchandisers of electrical appliances. Every one is more or less concerned over the fact that department stores, drug stores and specialty houses, recognizing the worth of electrical appliances, are taking them on—with successful results. But they are not getting down to the two true causes why we are not going ahead and holding the market. First, the various branches of the industry, for one reason or another, fail to support the merchandising department. Second, we as an industry are far from "sold" on the use of the appliances ourselves. When I say that the various branches fail to support the merchandising department I do not mean that this is necessarily intentional.

F. J. ALLEN

The attitude of the general public is that whenever a person is engaged in any form of electrical business, regardless of his actual job, he should know all about the various electrically operated appliances. And the general public is right.

The fact that we ourselves are very much "unsold" on the appliances was clearly evidenced at a recent Commercial Section meeting when, out of about 200 members present, only two were able to say that they used all or nearly all of the appliances which they were trying to sell. There is but one way to get real "honest-to-goodness" conviction on anything you are trying to push and that is to use it or do it yourself. We electrical men are not successful merchants primarily because we do not really know what and how the various devices perform their functions and the unlimited possibilities and economies which they introduce into the home.

In general, the failure to use appliances includes every one in the industry, and possibly the greatest burden and criticism can justly be laid at the door of the men higher up. Very often the homes of these people are largely conducted by servants, and because of this fact little real necessity for labor-saving devices is felt. But this is no excuse for them to hide behind, and the fact that they can better afford these appliances only makes their inactivity more open to criticism.

Few commercial managers realize their opportunities to educate all members of their organization to the fullest use of electric appliances in the home. It is true many cannot afford to equip their homes electrically all at once or pay cash for the larger appliances, but very few companies are offering the lowest prices and long terms of payment to employees.

There is another phase of the situation which also clearly shows the attitude of the industry as a whole toward the merchandising department. In many instances the appliance department, which should be given the choice location in the building, is put in the basement or some other equally inaccessible, unattractive place. Are we not all wrong in this attitude toward the appliance department? It is the department to which we look for a large portion of future business, and it must have every possible chance if its growth is to be assured. It is entitled to the best space in the building.

But the appliance manager can only go a certain distance in obtaining these necessary requisites. The executives must see the value of approving such changes as may be required to give merchandising every possible advantage and opportunity.

A Practical Check-Up on the Use of Periodicals

THIS card has proved an effective and almost automatic means of keeping track of the technical journals and other periodicals to which the Chattanooga (Tenn.) Railway & Light Company subscribes for its employees. All magazines are filed in the company's library. When a new copy comes in the librarian writes the name of the magazine on one of the cards and

F 354
OUT CARD FOR Electrical World

SIGN THIS CARD - PLEASE!

WHEN YOU TAKE
THIS MAGAZINE

THE COMPANY FURNISHES THESE PUBLICATIONS FOR THE FREE USE OF ALL EMPLOYEES. THEY ARE PLACED ON THIS RACK SO THAT YOU AND ALL OTHERS MAY HAVE EASY ACCESS TO THEM. IN READING THEM REMEMBER THE OTHER FELLOW, BY RETURNING THEM PROMPTLY. SIGN THIS CARD, AND IF YOU FORGET THE LIBRARIAN CAN REMIND YOU, OTHERWISE YOU MAKE TROUBLE FOR HER AND SHOW DISREGARD FOR OTHERS.

ARE YOU AN INCONSIDERATE CHUMP OR A REGULAR SORT OF FELLOW ?

SIGN ON SPACE BELOW - PLEASE

TAKEN BY	DATE TAKEN	DATE RETURNED	REMARKS
H.C. Doyle	10/17/21	10/20/21	
A. J. Warren	10-20-21		

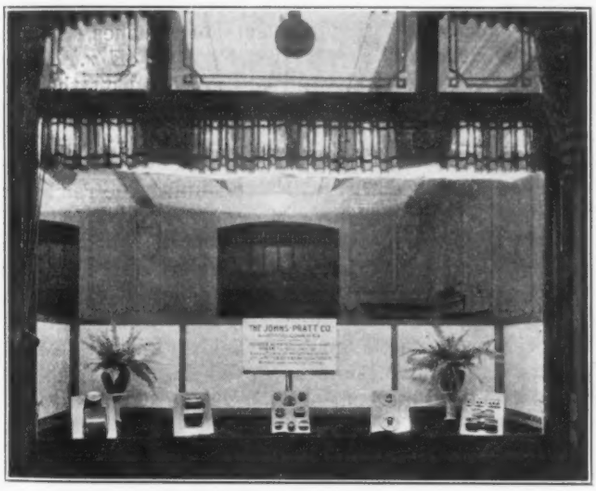
OUT CARD FOR PERIODICALS TAKEN FROM LIBRARY

places both the card and the magazine in the same rack. Any one wishing to take a paper from the library simply signs his name on the card with the date and leaves the card in the proper space, and upon returning the magazine the card is again dated.

It is thus possible to tell at all times who has taken any of the papers, and should there be a call for any particular magazine the librarian knows exactly where it can be located. This method has proved much more satisfactory than routing the magazines from one department to another, as there was then no record of their whereabouts and many were either completely lost or long delayed in being returned to the library.

Featuring Local Industries by Electric Utility

WITH a view to acquainting people with the products of local manufacturers, the Hartford (Conn.) Electric Light Company is displaying in its office windows the leading products of concerns using electric



WINDOW DISPLAY SHOWS PRODUCTS OF LOCAL MANUFACTURER

power from the company's system. One of these, showing meter testing and protective devices, molded insulation, packing and fuses, produced by the Johns-Pratt Company, is shown in the picture. A very satisfactory co-operation between the electric light and power company and a local electrical manufacturer was thus attained for the commercial good of the community as a whole. Popular interest in these displays is increasing, and the Hartford chamber of commerce has heartily approved showing the citizens finished products of their town, often unrealized outside trade channels.

Handling Customers' Stock for Resale

WHEN an owner of stock in the Central Maine Power Company requests that the utility shall repurchase his shares, as sometimes happens, the company does not guarantee to resell immediately or to buy back the stock. It does not repurchase stock, but in the case of a stockholder who bought his holdings directly from the company every effort is made to dispose of the stock through resale, charging a commission of $2.50 per share for this selling service. When stock is handled for resale it is sold at the same price for which the regular authorized issue is marketed. As a rule the resale transaction takes from three to ten days.

In cases where the stock was bought through a broker who has "traded somebody out" and hence sold it at less than the company price, the company does not plan to resell except at a price agreed upon in each instance. The natural channel for resales in such cases, the company maintains, is the banker or broker with whom the owner dealt. Employees engaged in customer-ownership campaigning, now a continuous program with this company, have been cautioned to make clear to the public that the company does not "buy back" stock.

What Other Companies Are Doing—

Faribault, Minn.—Donald Daube, securities salesman for the Northern States Power Company in its Faribault and southwestern Minnesota divisions, has established a new record in the sale of the company's preferred stock. In the period from Jan. 1, 1921, to Oct. 1, 1921, he added 803 shareholders to the Faribault division list, which nearly equals the 863 shareholders added during the previous five years and represents an increase of 93.5 per cent over the number of shareholders on Jan. 1 this year. In the Montevideo division he increased the number of shareholders from 281 to 499, an increase of 77.5 per cent. It is expected that by the end of this year the increase in both divisions will be at least 100 per cent.

Denver, Col.—An "Electrical Day" was featured at the weekly meeting of the real estate bureau of the Denver Civic and Commercial Association held Nov. 2, at which time the Denver Electrical Co-operative League had charge of the program. The part electricity plays in the modern home, the education of the public in things electrical and co-operation between the real estate interests and the electrical industry were stressed. T. O. Kennedy, chairman of the league's advisory committee, explained to the real-estate men how every dollar spent in the electrical equipment of a home added four dollars in value to the selling price of the property.

Humboldt, Iowa.—In promoting the sale of its securities to customers the Northern Iowa Gas & Electric Company is using an interesting window display which represents in miniature a night scene in a town. Streets are laid out in grass and gravel on the floor of the window and small houses with lamps concealed inside are placed along the street. Street standards about 6 in. high, equipped with Christmas tree bulbs, add to the effect. The entire display is worked out in perspective, and in the back of the window a sign reads, "Let your preferred stock pay your light bill." This display is being sent to the company's division offices and has proved a material help in the campaign.

New Haven, Conn.—Two hundred and twenty-four wiring jobs, totaling 6,760 outlets and 342 meters, have been installed in residences on the New Haven division of the United Illuminating Company, following a campaign of one month along co-operative lines with six local contractor-dealers. Customers were billed at $5 per outlet by the company, which paid the contractors $6 per outlet. The average was 30.17 outlets per job. Ninety-three per cent of the jobs had been paid for six months after the campaign, and the total outlay by the central-station company was $8,138, the campaign expenses being $1,378. D. P. Robinson, sales manager, states that the campaign helped the contractors to keep full forces busy and that it has brought them and the company into closer touch.

Digest of Electrical Literature

Including Brief Abstracts of and References to Important Articles Appearing in the Scientific and Engineering Press of the World

Generators, Motors and Transformers

Induction-Motor Nomogram. — R. G. WARNER. — A method for making a movable diagram for reading all performance characteristics of any three-phase induction motor.—*Journal A. I. E. E.*, October, 1921.

Design of Large Electric Units.—STANLEY PARKER SMITH.—This article explains details of design and shows the method in which field poles are fastened to rotating spiders. Numerous illustrations serve to make the text clear.—London *Engineering*, Sept. 16, 1921.

Brush Discharges in Air and in Oil.—W. KEHSE.—The insulation of transformers, switches and other high-voltage apparatus has so far been determined only from experiences gained from tests on actually built machines. The author gives in this interesting paper data to calculate beforehand the beginning of any dangerous brush discharge. As the type of winding used on transformers of very high voltage is invariably of the concentric design, the primary and secondary windings of such a transformer may be considered as concentric metallic layers, and any results obtained from such an arrangement may be used properly for the design of transformers. It has been proved that even short brush discharges under oil damage the insulating paper cylinders. Upon immediate removal of such a cylinder the damage may not be visible, but after standing for a few days in air the upper layers of the cylinder peel off and the carbonized brush-discharge paths become visible. The author gives test results obtained between needle points under oil and along the surface of resin-treated paper surfaces. The primary object of the paper seems to be to advocate air-insulated testing transformers. One illustration is given of an actually built 650,000-volt transformer consisting of three air-insulated units in series. Complete data and drawings are given for a 150-kva., 400,000-volt unit testing transformer of the air-insulated type. This is the second article to appear recently in the European technical press describing and advocating the design of testing transformers of very high voltage which shall be air-insulated. By following certain precautions as to proper distances, materials and specially formed metallic shields European manufacturers seem to have succeeded in building such transformer sets for more than 500,000 volts, showing great savings in floor space, weight and cost. It might be worth while to call the attention of American transformer designers to these types.—*Elektrotechnische Zeitschrift*, Sept. 22, 1921.

Side Wear of Brushes on Motors.—J. S. DEAN.—From a study of the side wear on carbon brushes in railway motors it is concluded that if the action of dust and dirt can be eliminated, side wear upon brushes in ventilated motors will be greatly reduced. It is not thought that all side wear is caused by the action of dust and dirt, as mechanical vibration and probably some burning action of the electrical current are contributing factors. Side wear, however, is relatively unimportant compared with the marked advantages of parallel-ventilated motors over closed motors or series-ventilated motors.—*Electric Journal*, October, 1921.

Novel Starting Method for Direct-Current Motors.—M. VIDMAR.—The author has developed and patented a new and very simple starting method for direct-current motors having multiple circuit (lap) winding—a method which entirely obviates the starter. It is suitable for all four-pole to eight-pole motors and consists in starting the machines with all but one pair of brushes lifted off the commutator. Assuming a four-pole motor, its armature represents four circuits put in parallel by the four sets of brushes, and the starting current is represented by $I = 4E/r$. If one positive and one negative brush are lifted off the commutator, the starting current will be reduced to only $I = 4E/3r$, or one-third of the first value. If it is attempted simply to disconnect the rest of the brushes from the line, brush fire will result under the remaining brushes. It is, therefore, not only necessary to lift the brushes bodily off the commutator, but with the brushes the commutating field, if the motor has commutating poles, must also be disconnected. This can be easily managed by connecting the brushes directly in series with these auxiliary fields. Actual tests on direct-current motors have proved the full feasibility of this starting method.—*Elektrotechnische Zeitschrift*, Sept. 29, 1921.

Mechanical Causes of Flashing on Railway Motors.—J. K. STOLTZ.—An enumeration of the causes of flashing, together with the proper remedies for preventing it. The most common causes are interruption and re-establishment of power supply by jumping trolley, etc., braking by bucking, presence of salt, incorrect brush spacing and jumping brushes.—*Electric Journal*, October, 1921.

Generation, Transmission and Distribution

Economical Generation of Electrical Power.—A. B. CLARK.—Design and operation of a plant of about 15,000 kw. average load with peaks running up to 25,000 kw., such as is found in the power plants of steel mills. Discussion includes the size of units to use, the type of condensers, the size of boilers and grates, and various types of auxiliaries.—*Bulletin of Association of Iron and Steel Electrical Engineers*, October, 1921.

Electric Generating Station of the Edinburgh Corporation.—S. B. DONKIN.—Some notes on the Portobello electric power station of the Edinburgh Corporation for supplying energy in bulk to the city of Edinburgh and to the Lothian. This is a 30,000-kw. steam plant.—London *Engineering*, Sept. 16, 1921.

High-Pressure Oil-Burning Installation.—A 15,000-kw. plant of the Fall River Electric Light Company converted from coal to oil burning is described.—*Power*, Oct. 25, 1921.

Power Extensions in Manitoba.—A description of the 66,000-volt Morden line installed by the Manitoba Power Commission.—*Electrical News*, Oct. 15, 1921.

Diesel-Engine Power Station of Lugano.—F. REGARD.—The city of Lugano derives its power supply from the hydro-electric station in Gordola, situated 23 km. from the city. In spite of a double high-tension line, operated under 45,000 volts, it happened several times that the supply failed because of the very severe climatic conditions that prevail on the right-of-way of the line, leading over the high Ceneri mountain range. It was therefore decided to erect in the city itself a standby power plant which could be started at a moment's notice. Two 2,200-kva. Diesel-engine generators were installed. They are two-cycle, four-cylinder engines, running at 125 r.p.m. A direct-current motor starter, fed from a storage battery, is employed. To synchronize properly with the Gordola plant, a remote-control regulator is provided on the Diesel engines, covering a speed range of —15 to +8 per cent. The interior of this station is more like a castle than a power house.—*Brown-Boveri Mitteilungen*, October, 1921.

Electrochemistry and Batteries

Rectifier Plant in Switzerland.—B. WALTY.—For the electrolytic manufacture of hydrogen and oxygen from water a large mercury rectifier plant was erected in Bodio, Switzerland, changing over 8,000-volt, 56-cycle, three-phase current into 430-volt direct current. Four 175-kva. steel vessel rectifiers were provided and have been in perfect operation since 1920. One three-phase transformer, connected "open-six-phase," with a ratio of 8,000 volts to 358 volts, operates the battery of rectifiers. To provide necessary regulation of the direct-current voltage a six-phase induction regultor is connected between the main transformer and the rectifiers, with a voltage range of plus or minus 36. The resistance of the electrolytic dissociator, when cold, is sufficiently large (1.6 ohms) to be started up on full voltage and with the high-voltage winding of the transformer in delta. If for some reason the dissociator has to be started up hot, its low resistance of only 0.25 ohm necessitates a start with reduced voltage, which is accomplished by connecting the transformer primary in star. During normal operation a vacuum of 0.001 mm. to 0.01 mm. mercury pressure must be maintained in the rectifier vessels. Two vacuum pumps are provided for this purpose, one of which is kept running from one-half hour to one hour daily. Both pumps consist of a rotary oil pump and a stationary mercury high-vacuum pump. The cooling water for the rectifiers is kept cool in an overhead battery of twelve radiators and is used over and over again.—*Brown-Boveri Mitteilungen*, October, 1921.

Comparison of Electric Furnace Practice with Fuel-Fired Furnace Practice.—N. K. B. PATCH.—The author's experiences are that the cost of metal melted, the melting losses and the solution of gases in metal are substantially the same in the electric and the fuel-fired furnace, provided that there is intelligent operation.—Paper presented before American Electrochemical Society, Sept. 30, 1921.

Recent Developments in Electric Furnaces of the Muffled Arc Type.—H. A. WINNE.—Several types of muffled-arc melting furnaces are described with their features and adaptabilities.—Paper presented before American Electrochemical Society, Sept. 30, 1921.

Installations, Systems and Appliances

Motor Drives on Rolls and Run-Out Table.—A description of special methods adopted in a new steel mill to co-ordinate roll trains and run-out table. Three-phase motors and frequency changers are used. This is the Interstate Iron & Steel Company's mill at South Chicago.—*Iron Age*, Oct. 13, 1921.

Insulation for Steel-Mill Motors.—J. L. RYLANDER.—Insulation on a motor must (1) protect against a short circuit between adjacent turns or other parts of the same coil, (2) protect against the ground strain in the slots or other parts in contact with the core, and (3) protect one circuit from another between which there is possibly full rated voltage, such as between one phase and another on a polyphase alternating-current motor and from the positive side to the negative side of the circuit on direct-current motor. Methods of fulfilling these requirements in steel-mill motors are described in this paper.—*Electric Journal*, September, 1921.

Gathering in Coal Mines.—R. L. KINGSLAND.—A discussion of the various methods of gathering coal and their limitations.—*Journal A. I. E. E.*, October, 1921.

Crane Operating Costs at Blast Furnaces.—GEORGE L. COLLORD.—Locomotive and ore-bridge cranes are shown to save much money compared with the hand methods formerly in vogue. An analysis of the cost per ton is given as well as a description of the motor equipment and the power consumption. The annual cost of operation of ore-bridge, bins and scale cars amounted in this case to about 21 cents per ton of pig iron produced.—*Iron Age*, Oct. 13, 1921.

Electric Auxiliaries on Merchant Ships.—E. D. DICKINSON.—A discussion which shows that electrically equipped ships can be operated more economically on account of the speed and reliability of electrical equipment. Most suitable machinery, wiring equipment and operating voltages are discussed. Costs of loading and unloading, wharfage, etc., are given.—*Journal A. I. E. E.*, October, 1921.

Telegraphy, Telephony and Signals

Magneto-Mechanical Systems Applied to Telephone Receivers.—R. L. WEGEL.—The object of this paper is to reduce the theory of typical magnetic vibratory devices to the simplicity of the electrical network theory. The method involves the manipulation of complex algebra and is illustrated by experimental data on receivers and transmitters. It is applicable to types having any number of circuits or vibratory systems, including galvanometers and meters.—*Journal A. I. E. E.*, October, 1921.

Radiation from Transmission Lines.—JOHN R. CORSON.—Radiation losses from lines on which high-frequency currents are transmitted, as in carrier-wave transmission over wires where frequencies are employed comparable with those used in radio communication, are discussed.—*Journal A. I. E. E.*, October, 1921.

Miscellaneous

Rates for Electrical Energy and Service.—F. W. C. BAILEY.—A discussion of the various types of rates, including the straight-line, step, block, Wright demand rate, Hopkinson demand rate, three-charge and other rates. Curves and concrete applications of the various rates help to explain the article.—*Journal A. I. E. E.*, October, 1921.

Scientific and Industrial Research

(PRINTED IN THE THIRD ISSUE OF EACH MONTH)

A Department Devoted to Reports of Investigations Contemplated or Completed, Research Facilities Available, and Suggestions for Co-operative Work.

Conducted by PROF. VLADIMIR KARAPETOFF
Cornell University, Ithaca, N. Y.

Research in Progress and Completed

[When investigations which have been completed are, in the opinion of the editors, of wide enough interest to the field we serve, details thereof will be presented in other parts of this paper. Contemplated research or that which appears to have limited appeal will be only briefly reported in this section, but details may be had by communicating with the investigator or institution named in the report. Readers are referred to the department "Digest of Electrical Literature" for investigations reported in other journals. The news and engineering sections should also be followed for research reported before technical societies.]

CIRCUIT BREAKERS, OIL, EXPLOSION CHAMBER FOR.

An improved explosion chamber has been developed for high-tension oil circuit breakers. The arc, which is drawn down by the movable contact at opening, forms gases in the chamber which create pressure, driving the oil into the arc. The remaining oil and gases are then forced through the outlet, thus extinguishing the arc very quickly.—*General Electric Company, Schenectady, N. Y.*

FEEDERS, AUTOMATIC SECTIONALIZING OF.

A switch has been designed to save feeder copper. It automatically ties together two feeders, permitting the flow of current from an idle to a loaded section, thereby obtaining the maximum amount of service. An automatic overload feature is included to limit the exchange of current between feeders to a safe predetermined degree.—*General Electric Company, Schenectady, N. Y.*

RELUCTIVITY, MAGNETIC, EFFECT OF HEAT TREATMENT UPON.

Experiments have been made on the variations of magnetic properties of some eutectoid carbon steel specimens (0.85 per cent carbon) for various kinds of heat treatment, especially at higher values of magnetizing force. A definite relationship has been found to exist between structural changes in the sample and the slope of the reluctivity line.—*Bureau of Standards, Washington, D. C.*

WATTMETER, POLYPHASE, WITH CONNECTING ROD.

A polyphase wattmeter has been developed of the electrodynamometer type in which the two potential coils, instead of being mounted on the same shaft, are mechanically interconnected by an aluminum rod and move like a single unit. The principal objection to polyphase wattmeters has been that, unless they are of the semi-flush type, they project farther out from the switchboard than the other instruments. The total moving element is lighter than that of the usual polyphase wattmeter. Furthermore, instead of pivots and jewels being subjected to the weight of two moving elements, in this design the jewels and pivots are subjected to no greater weight than in the case of a voltmeter or a single-phase wattmeter.—*F. W. Roller, New York City.*

TELEPHONE RATES, DETERMINATION OF.

A study of the economic factors which determine telephone rates has been completed recently. The valuation of telephone plants, their cost and depreciation, the operating revenue, including local and toll telephone rates, were all found to be determining factors and were thoroughly treated as such.—*C. A. Wright and F. L. McKinney, Ohio State University, Columbus.*

MINES, EXPLOSION-PROOF MOTORS AND SWITCHES FOR.

Investigations and tests have been conducted to determine the danger of ignition of mine gases from electric motors equipped with protective devices and from various types of oil-break and air-break switches.—*Bureau of Mines, Washington, D. C.*

WAVE STUDY BY MOTION PICTURES.

Motion pictures have been made showing the propagation, interference and reflection of water waves. A stream of compressed air was interrupted by passing through a circle of holes in a rotating disk, so that the puffs of air impinged periodically upon a water surface. The waves generated were made visible by flashes of light coming through a second series of holes in the same rotating disk that were reflected upward through the glass bottom of the water tank so as to cast a shadow of the waves on a frosted glass. The photographs were taken of these shadows. The flashes of light came a little less frequently than the waves, so that the latter appeared to move slowly, and the shadows were a composite of a number of waves.—*F. R. Watson, Urbana, Ill.*

[The motion-picture camera is being used more and more in the study of performance of brushes, circuit breakers, etc. The above description illustrates one of the methods of using such a camera.—EDITOR.]

VACUUM TUBE, DOUBLE-GRID, CIRCUITS FOR.

Some new vacuum-tube circuits have been devised to be used with double-grid tube. The particular advantage of the proposed arrangement is that the locally generated oscillations of the tube cannot excite the aërial and cause disturbances in neighboring receiving stations.—*J. Scott-Taggart, London, England.*

LAMPS, INCANDESCENT, STANDARD SPECIFICATIONS FOR.

New specifications have been adopted which include important changes in the test procedure for tungsten lamps. The most notable of these changes is the abandonment of the long-established provision that the life of test lamps shall be considered as ended when the candle-power has fallen to 80 per cent of the initial value. Now the life is considered as the total life of the lamp since the efficiency of tungsten lamps drops but very little up to the point of burn-out.—*Bureau of Standards, Washington, D. C.*

TELEPHONE CROSS-TALK METER.

A meter has been designed for giving a quantitative idea of the qualities of the various pairs of wires in a telephone cable as regards that irritating feature known as "cross-talk." A telephone receiver is so arranged that it may be shunted across one pair of wires, which are used as a transmitting circuit. The shunt is through a high variable resistance. A switch is so arranged that the telephone receiver may then be quickly put across any other pair of wires in the cable, and the intensity of the sound as heard through the resistance in the main circuit is compared to that heard by induction in the neighboring circuit. The cross-talk factor is found by varying the resistance until there is no change in audibility when shifting from one connection to the other.—*Cambridge & Paul Instrument Company, London, England.*

ELECTROLYSIS, EARTH-CURRENT METER FOR.

Final experimental trials of the earth-current meter have been completed and the utility of this instrument for practical electrolysis survey work has been definitely established. Several of these instruments have been used in connection with the co-operative work of the bureau and the research sub-committee of the American Committee on Electrolysis.—*Bureau of Standards, Washington, D. C.*

PYROMETER, TUNGSTEN-MOLYBDENUM.

A tungsten-molybdenum pyrometer has been developed for measurements of temperatures above the range of ordinary thermocouples. A coating of crystalline carborundum, copper, portland cement and quartz is fused to the thermocouple to prevent oxidation at high temperatures. Numerous tests have shown that the thermal emf. between tungsten and molybdenum reverses when the hot junction passes through 1,060 deg. C.—*George F. Dickins, Stone & Webster, Inc., Boston, Mass.*

Suggestions for Research

PROTECTIVE DEVICE AGAINST CONTINUOUS OVERLOADS.

The usual overload protection of electric motors is set by operators high enough to take care of short-time peak loads. Most motors are without any real protection against continuous overloads which may finally injure them. There is, therefore, opportunity for developing overload devices which will have time elements of five to thirty minutes instead of five to thirty seconds, as is the case with most of the existing apparatus. The longer the time element can be made, the more desirable it is for operation of motors.—*H. D. James, Pittsburgh, Pa.*

TEMPERATURE MEASUREMENT IN EMBEDDED WINDINGS.

A better method is needed for measuring the actual "hot-spot" temperature of stator windings of large alternators and of other embedded copper conductors. On account of a considerable temperature drop across the thick insulation in a high-tension machine, the temperature measured by a thermocouple placed in the slot may be much lower than that of the copper itself. Resistance measurements are practically useless because the cooler parts of the conductors in the end connections are included. A device or method is needed for determining the actual maximum temperature of copper, without any electrical connection with the high-tension winding and without leads that would impair the continuity of the insulation.

CURRENT TRANSFORMERS, SHORT-CIRCUIT STRESSES IN.

Under a heavy sustained short circuit on the line, a current transformer may carry many times its rated current and the resulting mechanical stresses may injure the insulation, thus facilitating a burn-out. Mr. Torchio reports an aggravated case in which the primary winding blew open (*Journal A. I. E. E.*, 1921, page 128). A theoretical and experimental investigation of these stresses is desired, with suggestions for improved design. With a miniature model an investigation may be possible with direct current. If alternating current is used, a motion-picture camera synchronized with an oscillograph will be found serviceable.—*Editorial Suggestion.*

TELEPHONE, AUTOMATIC, TRAFFIC.

An investigation is desired toward establishing and placing upon record once for all a logical method of attack whereby one may calculate the number of trunks in a group required to give good service for a given amount of traffic. The investigation should be partly experimental, involving the recording of traffic over groups of automatic trunks, and very largely mathematical, discovering the proper way to apply the theory of probabilities to this problem. A difference will be found between manual and automatic operations of groups of trunks, and the features of this difference should be incorporated in the complete treatment.—*A. B. Smith, Chicago, Ill.*

HARMONICS IN VOLTAGE WAVE, AMPLITUDE AND PHASE OF.

The development of a readily portable device is desired for the determination of amplitude and phase angles of the harmonics in a voltage wave. An instrument which could be carried about as readily as present types of portable meters would be of value in making investigations of abnormal conditions arising in a high-tension system. The oscillograph is bulky and its transportation is not convenient, especially where power houses are located in districts remote from railway stations.—*W. P. Dobson, Hydro-Electric Power Commission, Toronto, Ont.*

BOOSTER FOR BATTERY CHARGING.

In the manufacture of storage batteries, and also in large repair shops where batteries are restored to usefulness after hard service, it is necessary to charge and to discharge cells more than once. It should be possible to arrange the routine operations in such a way that one battery is charging while another of about the same ampere capacity is discharging. Considerable energy could be saved by circulating the same current between the two batteries by means of a booster in series with the charging generator. Details of such an arrangement are desired, an automatic regulating device, the saving involved, etc.

News of the Industry

Chronicle of Important Events and General Activities in the Technical, Commercial and Manufacturing Fields With Announcements and Reports of Association Meetings and Conventions

Alabama Power Leases Muscle Shoals Steam Plant

THE Secretary of War has authorized the execution of a temporary lease of the large steam plant at Muscle Shoals to the Alabama Power Company. The lease may be discontinued on one month's notice and is intended solely to relieve the emergency caused by the continued shortage of water in the streams which furnish the power for many of the industries in the Southeast. Secretary Weeks stated that while he had been disinclined to lease the plant with negotiations for its sale pending, the emergency is such as to justify this step, especially at a time when great hardship would result in adding to the number of unemployed.

London Superpower Proposals Expected Soon

THE Electricity Commissioners of London will report at an early date on plans to obtain cheaper electric power in the metropolitan area and in its vicinity, according to advices to the Department of Commerce. The London County Council proposes to arrange a superpower system which will link several large projected plants with the existing plants. It is claimed that this will make possible decided reductions in the cost of power and will permit of additional electrification of railroads.

Department of Commerce Champions Trade Association Idea

DESPITE the criticisms that have been heaped upon the trade associations and the disinclination on the part of the Department of Justice to attempt to clarify the situation prior to the decision of the Supreme Court in the hardwood lumber case, the Department of Commerce is actively championing the trade association idea. Secretary Hoover and members of his staff are taking pains in their utterances to show that the questionable conduct of a very few trade associations, or aggregations calling themselves trade associations, has resulted in uncharitable criticism of all trade organizations. Mr. Hoover has expressed himself so definitely on the subject that there can be no doubt that he believes trade associations are necessary to the maximum progress of industry. The rapid multiplication of trade associations until they number nearly 3,000 is interpreted by Mr. Hoover to indicate "a great and vital movement and something permanent in our economic system." Other quotations from Mr. Hoover on the subject follow:

"The coming together of manufacturers and producers in the different trades for the purpose of the advancement of their industries as a whole is a profound step toward co-operation in the whole business world. Out of it will be gained tremendous benefits for the business public. The various trade associations present a point of contact with the Government such as did not exist ten years ago.

"I know of no way in which we can undertake the solution of collective questions except by the co-operative organization of the men in the industry. We cannot go on maintaining our standard of living in the face of the foreign competition that we have in front of us unless we can make some progress in the collective sense. The only way that we can hope for it is through the organization of associations that will take up the problems common to all and gain inch by inch the efficiency and stability that make for national efficiency."

F. M. Feiker, assistant to the Secretary of Commerce, in a recent public address said:

"The trade association is the natural organization functioning in the establishment of contacts between the Government and industry. They are indispensable in such matters as the collection of statistics, the detailed promotion of foreign trade and in elimination of excess variety. It is the only avenue that the Department of Commerce sees by which the Government can establish contact with a trade to the mutual advancement of fundamental interests."

Pacific Coast N. E. L. A. Section Changes Name

THE Pacific Coast Electrical Association was selected as the new name of the Pacific Coast geographical division of the National Electric Light Association at a general meeting held in Delmonte, Cal., last week. The new name is felt on the coast to be more expressive of the functions and scope of the organization and less cumbersome than the old. It is not intended that the relations of the association with the National Electric Light Association with which it will continue to be affiliated will be affected. A revision of the constitution is to be undertaken which will more clearly define the status of the Pacific Coast Electrical Association. This revised constitution will come up for adoption at the annual convention which will be held in Riverside, Cal., next May.

Southwest League to Hold Colorado River Conference in December

THE League of the Southwest will hold, at Riverside, Cal., Dec. 8, 9 and 10, a conference on the subject of the Development of the Colorado River, which will be for the purpose of crystallizing opinion on the subject. Nationally known men are expected to be present and address the meeting, principal among them being Herbert Hoover, who has provisionally planned to attend the meeting and deliver an address written by Presi-

dent Harding. The Federal Water Power Commission will be represented by executive Secretary O. C. Merrill, who will outline the policies of that body with reference to power development on the Colorado River. Governors of the several states of the Colorado River Basin have signified their intention of being present and address the meeting as have also representatives of all other bodies interested in this development. Sir Adam Beck of the Hydro-Electric Power Commission of Ontario is expected to present the case for the advocates of political development and ownership.

Complete Service Necessary to Hold Exclusive Territory

IN ORDER to retain exclusive rights in a field a public utility must be serving it to an extent where competition would involve duplication and waste, and in addition it must be alert to render all proper service not only to patrons but to prospective patrons. When the entrance of a new utility into a field will result in greater industrial development it will not be excluded. These principles of regulation were contained in a decision of the California Railroad Commission recently permitting the Great Western Power Company to render industrial service in Butte County over the protest of the Pacific Gas & Electric Company, which charged its competitor with invading its territory. The contest between the power companies arose over the right to furnish power to a lumber company at a mill to be erected near Oroville, an account estimated at $60,000 a year. After carrying on negotiations with the two power companies the lumber firm entered into a contract with the Great Western Power Company. The commission found in effect that the Great Western Power Company had shown more eagerness for the business; in fact, had virtually developed it by inducing the company to use electricity in its mill as well as in its logging operations.

The lumber company had first intended to use electric power only for its logging operations at Moretown, about 25 miles from Oroville, and according to the findings of the commission the Pacific Gas & Electric Company "virtually refused to serve the logging works." After the Great Western Power Company had offered to furnish power to the logging camp and had induced the lumber company to use electricity at the mill also, the Pacific Gas & Electric Company protested against the contemplated mill service, claiming that it had exclusive rights to supply electric power in the vicinity of Oroville.

DUTY TO MAKE EXTENTIONS

That the Pacific Gas & Electric Company failed in service in not doing everything in its power to assist a large industrial concern seeking to enter the state was the conclusion of the commission, which said: "A utility owes a duty to that portion of the public which seeks to obtain service as well as to that portion which is already being served. It is the duty of a utility in proper cases to make extensions in order to serve new consumers and to furnish information to prospective consumers as to the costs or terms under which such extensions may be made. The evidence in the present case shows that the Pacific Gas & Electric Company did not perform its duty to the public in this respect. The lumber company was given no information which would enable it to determine whether or not it was feasible or profitable for it to use electrical energy at its logging camp."

Pointing out that it has consistently encouraged the development of hydro-electric power, the commission asserted that it was not its policy to exclude from a field a company which created new uses for power. Elaborating this position, the commission said: "As it was said in this and other former opinions, whenever the coming of a new utility into a territory will serve to develop such territory and to build it up either industrially or agriculturally and thereby enhance the general prosperity of the state such utility will not be excluded. It appears from the evidence that the Great Western Power Company was largely responsible for the action of the lumber company in changing its plan with regard to the use of power at its mill near Oroville. It is quite possible that had it not been for the efforts of that company electrical energy would not have been used at all at this mill. The state is interested in the development of its natural resources through the development and sale of hydro-electric energy. This commission has encouraged utilities to develop hydro-electric energy. Competition which results in new uses for and the additional sale of electrical energy is not to be stifled unless it appears that such competition actually results in harmful duplication and economic waste. In the present case we do not believe that serious duplication will result. Nor is this a case where one utility is taking the 'cream of the business' by taking a large consumer away from another utility. Rather does it appear here that the Great Western Power Company is developing business which would not otherwise have been developed."

The Great Western Power Company was sharply criticised by the commission for entering into a contract with the lumber company before securing a certificate, and the commission adds that it is difficult to understand how the company could have assumed that a certificate was not necessary.

Few Bond Issues of Electric Light & Power Companies in Default

DEFAULTED bonds of public utility companies are, according to a list compiled by Dow, Jones & Company, New York, fewer in number and less in value than a year ago, the total par value of such bonds being placed at $470,000,000 against $494,858,000 on Nov. 25, 1920. Traction issues make up the greater part of the list, defaulted bonds of traction companies in greater New York alone totaling more than $176,000,000. Among electric light and power companies defaulted paper is conspicuously small, the total among companies doing a lighting and power business in part or entirely amounting to less than $28,500,000, divided as shown in table above.

Alfred Light & Power first 5's	$250,000
Commonwealth Power of Nebraska 6's	750,000
Memphis Consolidated Gas & Electric 5's	5,159,000
Merchants Power first 5's	1,260,000
Michoacan (Mexico) Power first 6's	1,680,000
New Orleans Railway & Light refunding 5's	6,118,000
Pensacola Electric 7 per cent notes, 1921	281,900
South Carolina Light, Railway & Power 5's	3,497,000
South Carolina Light, Railway & Power 7 per cent notes, 1921	450,000
United Traction & Electric 5's	9,000,000
Total	$28,445,900

Washington Clothed in Illuminating Splendor

IN HONOR of the "unknown soldier" and as a greeting to the delegates to the disarmament conference, Washington was ablaze on Friday and Saturday nights last week with electric light. A jeweled archway, consisting of two obelisks, 85 ft. high, with a jeweled curtain suspended between, served as an approach to the building where the arms conference convened. An avenue of light consisting of thirty-two Roman lamps in rows on each side of Seventeenth Street stretched from the Corcoran Art Gallery to the jeweled archway.

Behind the dome of the Capitol and visible for miles was the "light of the states," an "aurora borealis" with rays of tinted light radiating in all directions. At the base of the Washington Monument were four searchlamps bathing the monument in light clear up to its top. From the top searchlights also played upon the White House, the dome of the Capitol, the United States Naval Observatory, the amphitheater at Arlington, the Soldiers' Home and the Bureau of Printing and Engraving. Other features consisted of illuminated banners of artistic design and rose-tinted lights embellishing prominent buildings.

The illumination was planned by W. D'A. Ryan, illuminating engineer of the General Electric Company. The entire scheme is an adaptation of the illumination originally planned for President Harding's inauguration.

Four Different Proposals for Developing the St. Lawrence

FOUR different ways of developing the St. Lawrence River were placed before the International Joint Commission in Ottawa on Monday of this week, known as the Wooten-Bowden, Hydro-Electric Commission, Connolly and Cooper plans. The first is that submitted last July by W. A. Bowden, chief engineer of the Canadian Department of Public Works, and Colonel Wooten, representing the United States government, for a single power development at the Long Sault and for canalization of the rest of the river to provide a waterway for shipping. Under this scheme 1,450,000 hp. is to be developed.

The Hydro-Electric Power Commission of Ontario made three proposals, the first being identical with the Wooten-Bowden plan, the second and third somewhat similar, though providing in addition to the Long Sault development a smaller one at Morrisburg. The additional power to be thus derived is placed at 100,000 hp.

W. S. Connolly, representing the New York & Ontario Power Company of Waddington, N. Y., in his plan provides for a series of dams from Waddington to Morrisburg, developing 660,000 hp., and a second series at the Long Sault, developing slightly in excess of 1,000,000 hp.

The fourth plan is that of Col. Hugh L. Cooper, consulting engineer of New York. Under this it is proposed to develop 5,400,000 hp. in four stages, utilizing the entire river. Colonel Cooper, in presenting his plan, asserted his conviction that dams could be built at the places he had selected because he had ascertained that the required foundations are there. He also emphasized the handicap the other systems would be under because of ice troubles.

It is interesting to note in this connection a statement attributed to H. G. Acres, hydraulic engineer for the commission, that experiments in heating the water adjacent to generating plants are to be carried out by the commission for the purpose of eliminating ice troubles.

Manufacturers Must Create Demand

PRESIDENT R. J. RUSSELL of the Electric Power Club, in his address at the fall meeting of the club, held at Cleveland on Nov. 14, called attention to the conditions which the electrical industry is now facing and indorsed the general opinion that business has turned the corner. He pointed out, however, that too great a percentage of the business done by some manufacturers is not created by them but just naturally flows to them. Owing to this situation, he believed that in most cases manufacturers should spend more money in developing a demand for the apparatus they manufacture. This activity, he maintained, should, in addition to the various forms of advertising, include a sufficient amount for the training of sales engineers. Another form of development he urged is an increase in the number of machinery manufacturers that will foster the sale of motor-driven units. He pointed out that records show that there were 1,030 electrical apparatus and supply manufacturers in 1914, their product being valued at $335,000,000, and 1,403, or a 40 per cent increase, in 1919, with an increase in value of products to $884,000,000. He urged that these companies should be classified and become members of the American Manufacturers of Electrical Supplies because their policies and acts directly influence public opinion on the electrical industry. He said the Electric Power Club has among its membership a majority of all electrical apparatus manufacturers, these manufacturers producing 85 per cent of the product coming within the scope of the club. He urged the members to become familiar with the work of other electrical associations.

In referring to the activity of the Electric Power Club in establishing standards for the guidance of its members, Mr. Russell voiced a need for the compilation and insertion in the Electric Power Club handbook of those suggested standards which have failed of adoption and are now frowned upon by the club.

Mr. Russell's address was received with enthusiasm, and a recommendation was unanimously adopted to print it and distribute it to all members.

At the second session A. H. Moore of the General Electric Company outlined the work of the National Industrial Conference Board and the formulation of rules covering life hazards in electrical installations. He was followed by Victor Tousley, head of the electrical inspection department of the city of Chicago, who described in some detail the formulation of Chicago rules covering fire hazard and hazards to life and limb. He reported a high percentage of compliance in a number of rules, particularly those referring to the safety switch and the inclosing of motors. He explained the responsibility of municipal inspection departments in the creating and enforcing of safety provisions and pointed out that it was the ambition of his department to co-operate in this work rather than to impose impossible restrictions. He maintained that the Chicago rules bear liberal interpretation and that the same degree of protection is not required in all cases. Certain installations require safety measures against both fire and

life hazards, while others, on account of the conditions of installation, require protection from one hazard only.

At this session S. L. Nicholson, at the request of the president, outlined the co-operation which the electrical industry is giving to the government, and particularly to the Department of Commerce in response to an invitation received from Secretary Hoover. This invitation suggested the appointment of committees to act with the Department of Commerce in the reorganizing of the work of the Bureau of the Census, which is seeking to develop monthly statistics on production and stocks and to systematize the relations of the bureau with the specialized fields of industry in connection with the biennial Census of Manufactures. This invitation also referred to similar co-operation with the Bureau of Standards, which is seeking to systematize its relation to the various activities of the industries with which it has heretofore come in contact. Mr. Nicholson explained the nature of labor statistics covering the electrical industry that are now being compiled by the National Industrial Conference Board.

At a banquet on Monday night Col. Leonard P. Ayers, vice-president of the Cleveland Trust Company, gave an interesting lecture on business conditions, in which he continually emphasized that "business is prices." In developing this thought he showed the trend of prices over a long period in the history of this country and interpreted their rise and fall in economic conditions. He showed that from 1810 to 1920 the cycle of price changes has comprised periods of twenty years of increases in prices followed by thirty years of decreases in prices. The first such cycle was started during the war of 1812, when the maximum price index was 250. The second one was started by the civil war, when approximately the same price index was reached, and the third one was started by the world war in 1914. He pointed out that the conditions under which business was conducted during these various cycles were very different and that due consideration of this fact is important in an analysis of any business situation at the present time and in predictions for the future.

50-DEG. RESOLUTION

The morning of Tuesday was devoted to a meeting of the board of governors, followed by a general afternoon session. At this time there came up for consideration the proposed revised constitution and bylaws for the Electrical Manufacturers' Council, which had previously been approved at a joint meeting of the members of the board of governors of the Associated Manufacturers of Electrical Supplies, the Electrical Manufacturers' Club, the Electric Power Club and the council. This action, which proposed a broader scope and more authority for the council, was considered advisable in order to enable the council to handle in a more effective way the important national problems affecting the many branches of the electrical manufacturing industry which are embraced in the three organizations involved. The general meeting unanimously indorsed the proposed revisions. Under the new arrangement the members of the boards of governors of the three organizations will constitute the representatives of their organizations in the council. Direct contact of the boards of governors assures the necessary consideration of matters concerning their interests as a whole and prompt action on them. This action enlarges the membership of the council to a group of thirty-eight representatives.

At this meeting also the question of 40-deg. and 50-deg. motor ratings was presented in a joint report of the fractional-horsepower motor committee, the large-power motor committee and the generator committee. This report presented the recommendation approved by these committees at a joint meeting in Cleveland on Oct. 7 last and, in accordance with instructions from the board of governors dated Sept. 20, brought up for consideration in the general meeting of the Electric Power Club. The recommendation follows:

Whereas the Electric Power Club has at the present time two adopted standards for open-type continuous-duty motors, described in Rule 5,303 as the 40-deg. rating and the 50-deg. rating; and

Whereas, during a period of progressive development of the use and application of the 50-deg. rating, it has been considered necessary to differentiate between the various uses and applications of the 50-deg. rating and to recognize as a departure the 50-deg. rating where sold for general purposes as distinguished from the 50-deg. rating specially applied; and

Whereas, in the judgment of the Electric Power Club, this differentiation in the use and application of the 50-deg. rating is no longer necessary; and

Whereas the purchasing public now recognizes the two ratings for open-type machines with continuous time ratings, and with proper co-operation on the part of the manufacturers and proper education can intelligently apply whatever rating in its judgment best meets the duty cycle and conditions of service to which the motor or generator is to be applied;

Now, therefore, be it resolved, that all limitations in respect to the 50-deg. rating as an adopted standard of the Electric Power Club be removed, as follows: [Then followed detailed references to items in the handbook with appropriate changes].

This resolution was unaimously approved by members present at the meeting.

This joint report also contained a recommendation to change Rule 1,123 so that this rule will read as follows:

A machine in which the ventilating openings in the frame are protected with wire screen, expanded metal or perforated covers, the openings in which must not exceed ½ sq.in. in area, must be of such shape as not to permit the passage of a rod larger than ½ in. in diameter, except that where the distance of live parts from the guard is more than 4 in., the openings may be ¾ sq.in. in area, but must be of such shape as not to permit the passage of a rod larger than ¾ in. in diameter.

At this session it was voted to elect a permanent secretary and establish an office of the Electric Power Club at some convenient point.

Chicago Committee to Support Landis Award

REPRESENTATIVE business men of Chicago to the number of 150 from the various business and civic organizations of the city will act as a citizens' committee to bring about full adoption of the Landis building award. The appointments were made by Joseph R. Noel, president of the Association of Commerce, and include Samuel Insull and John F. Gilchrist of the Commonwealth Edison Company and B. E. Sunny of the Illinois Bell Telephone Company. John W. Leary, on whose motion the appointments were made, says of the committee work: "The committee is making no fight on trade unions as such. Those unions which have accepted the Landis award and are working under it will have the support of the committee in their action. Those crafts which withdraw from the award or refuse to accept its conditions automatically place themselves beyond the support of the public."

Western States Gas & Electric Company to Build New Hydro Plant

THE California Railroad Commission has authorized the Western States Gas & Electric Company to proceed with the construction of a hydro-electric power plant on the south fork of the American River and to enlarge its existing plant. The plans of the company call for the development of storage reservoirs on tributaries of the American River and the construction 10 miles above its present plant of a new hydro-electric plant with an ultimate capacity of 100,000 hp. The additional water resources to be developed will be available to increase the capacity of the company's present plant to approximately 56,000 hp.

In order that the bonds to be issued may be a first lien upon the project, the Western States Company has organized the El Dorado Power Company as a subsidiary. All of its stock will be held by the Western States Gas & Electric Company, which will also guarantee its bonds.

Doherty Properties in Ohio to Be Interconnected

FOR the purpose of combining and interconnecting several of the Doherty properties in Ohio the Ohio Public Service Company has been incorporated to act as holding company for the properties in Warren, Alliance, Massillon, Elyria and Lorain. The demand for power has loaded to capacity the plants at all of these places, and additional generating units can be installed only in the Trumbull Public Service Company's plant at Warren, where there is sufficient water available for condensing purposes.

A high-tension transmission line is to be built at once connecting Warren, Alliance and Massillon. Later transmission lines will be built to connect Ashland, Lorain and the intervening territory. In addition it is proposed to construct a transmission line to a site on the Ohio River where a plant will be constructed of sufficient capacity to supply the future demands of the entire system.

Comprehensive Analysis of Rural Service Situation to Be Made

AN ANALYSIS of farm service methods is to be made by the rural service committee of the N. E. L. A., according to plans outlined at its meeting last week in Chicago. The committee intends to select several of these methods, which are more or less alike in principle, differing only in application, and include them in its report with discussions of the advantages and disadvantages of the points wherein the methods differ. It is also proposed to collect data and make such an investigation as will facilitate a more correct determination of the difference in costs between urban and rural service. The committee believes that there should be some standard form for rural-service line construction, and it is consequently going ahead to collect information on present practice. The committee also believes that it is absolutely necessary to educate the farmer to the value of electrical service and is consequently planning to gather information to show in a conclusive way that the farmer can pay a rate sufficient to make this kind of service profitable to the utility. Believing that there is a lack of electrically driven farm machines, the committee plans to point out to manufacturers in a general way the things that are most needed.

Compilation of statistics showing the number of farms in the country, how they are distributed and the number of lines necessary to serve them, and an approximate estimate of the cost of such a system, are among the further plans of the committee.

One Hundred and Fifty Thousand Hear Arlington Exercises

SOUND amplifiers and the latest developments in long-distance telephony made it possible for approximately 150,000 persons in Washington, New York and San Francisco to hear the Armistice Day exercises at the Arlington (Va.) National Cemetery as clearly as if they had been there. This was the largest audience that had ever been able to hear the same speaker simultaneously and the first time that a crowd had been addressed at such long distance. Col. J. J. Carty, vice-president of the American Telephone & Telegraph Company and head of the development and research department which perfected the apparatus used, declared that the exercises could have been heard in many other cities but for the fact that much of the apparatus required was of such recent development that the parts could not be manufactured in time.

PART OF THE THIRTY THOUSAND IN FRONT OF MADISON SQUARE GARDEN IN NEW YORK

Upon being questioned regarding his opinion of the significance of the development, Colonel Carty said: "It constitutes an event of the first magnitude in communication. It enables audiences in numbers and size heretofore undreamed of to hear a speaker's voice or the sound of music at the moment of delivery despite the distance of its origin. With more elaborate preparations it will be possible for the President of the United States, if he so desires, to talk to audiences assembled in every state in the Union without leaving his desk, or the head of an industrial corporation may address simultaneously his workers gathered in plants all over the country. The achievement will even have a marked effect on the future design of auditoriums. No large one will be complete without the loud speaker."

The tremendous physical accomplishment was not the only thing. Colonel Carty went on to say: "The results transcend the importance of the apparatus involved. More important than the scientific aspects was the fact that masses of people separated by nearly 4,000

miles were thereby enabled to pray, to sing and to listen in unison. The results were sublime and impressive The emotions aroused cannot be expressed in print; they must be experienced.

By far the most difficult problems which had to be solved in developing the loud-speaker system were those involving the transmission and reproduction of speech with such perfect fidelity that all individual characteristics and modulation of a speaker's voice would be accurately preserved. These problems were much more difficult than that of simply amplifying the voice. Nevertheless, the present loud-speaker system has proved eminently successful from each of these viewpoints.

In general, the system comprises two distinct sets of equipment, namely, (1) the apparatus for receiving the sound vibrations and amplifying them at the delivery end, and (2) the intervening telephone circuits. The outward appearance of the loud-speaker, as installed at Madison Square Garden, where 30,000 people are estimated to have heard the exercises, is shown in the accompanying illustration. Similar but concealed projectors were employed inside the auditorium. At Arlington Cemetery the projectors were placed on top of the semicircular colonnade of the amphitheater, but there too they were concealed from view of the audience. Tests made by the telephone engineers showed that in general the best acoustic results are obtained by the use of a large cluster of projectors, rather than a number of small horns distributed at intervals over the area to be covered. In the long-distance telephone circuits between Washington and San Francisco there were fifteen small amplifiers or telephone repeaters placed at intervals of about 300 miles. Each of these repeaters amplified the incoming energy about eleven times. Both the repeaters and the loud-speaker amplifiers involved the application of the so-called "vacuum tube," which is rapidly becoming one of the most important items of electrical apparatus. While the vacuum tube is the direct result of many recent discoveries in science, much of the credit for its present state of perfection belongs to the telephone engineers already mentioned and to the laboratories of the Western Electric Company, of which Dr. A. C. Jewett is director.

Southern Power to Build Two New Plants

THE Southern Power Company, with headquarters in Raleigh, N. C., announced this week that it has just let contracts for the wheels and generators for two new stations on the Catawba River, one at Great Falls, S. C., and the other at Mountain Island, N. C. For the first, to be known as Great Falls Power House No. 2, three 18,750-kva. units have been ordered. It is expected to have the plants completed and ready for operation in twelve months. The Southern Power Company already has a dam at this place and a plant developing 40,000 hp.

Construction at Mountain Island will be from the ground up, as there is nothing on the site now but the remains of the old Mountain Island cotton mill, which was washed away in the flood of 1916. Both dam and plant are to be constructed here, besides necessary preliminary work, and it is estimated that it will take two years to complete the job. Four 18,750-kva. units have been ordered for this plant. This will be the second largest station in the company's system, being exceeded only by the station at Wateree, S. C., with 84,000 hp. capacity. To facilitate construction of the plant, the Piedmont & Northern Railway, a subsidiary of the power company, will be extended three and a half miles from Mount Holly to the scene of operations.

The news that the Southern Power Company is to resume construction work, discontinued some three years ago, is received with intense gratification throughout the Piedmont section. For some time there has not been enough power available to meet all the demands, and the power company has not been able to make any important new contracts for a year or more. Although it has been generally known that the company had no power to sell, it has on file now applications for 35,000 hp.

The wheels and generators in the two plants will be of identical design. The wheel contract has been let to the S. Morgan Smith Company and the generator contract to the Allis-Chalmers Company. Contracts for the construction work are to be let shortly.

Open Meeting for Metermen to Be Held in Springfield, Ill., in February

THE national meter committee of the National Electric Light Association will hold an open meeting in Springfield, Ill., on Feb. 15 in the Sangamo Electric Company's assembly hall, at which metermen and men who are interested in the metering of electrical current, especially those who are directly in charge of meter departments, are cordially invited to be present.

The committee in charge has arranged an interesting and educational program and feels that considerable benefit will be derived by those who are in attendance at this meeting. The national meter committee is asking for a large attendance so that it may find out the problems which the men have and help to solve them.

Manitoba Power Building Large Plant on Winnipeg River

THE MANITOBA Power Company, Ltd., is building on the Winnipeg River at Great Falls a hydro-electric plant which will have an ultimate rating of 168,000 hp. The initial capacity will be 56,000 hp., consisting of two 28,000-hp. units. The plant will operate under an effective head of 56 ft.

The company is also building 17 miles of high-tension line from the Great Falls plant to a connection with the existing line from the Pinawa hydro-electric power plant of the Winnipeg Electric Railway Company to Winnipeg.

New Orleans Negotiations Halted

A DECISION of the Louisiana Supreme Court continuing in force the injunction restraining the city of New Orleans from entering into any agreement with the New Orleans Railway & Light Company on car fares caused the negotiations between the city and the company to come to a halt last week. It had been confidently expected that all points in discussion would be amicably settled this week. It is now felt that nothing can be done until the city has got free from the injunction proceedings.

All this time the company is unable to go ahead with electrical development because its plans for extending service are a part of the proposed joint agreement. There are now more than 3,000 unfilled applications for electric light and power service.

Wireless Telephony Carries the Final Speeches of Mayoralty Candidates.—The heated mayoralty campaign in New York City came to an end last week on the eve of election with bursts of wireless eloquence from both candidates. Their final appeals and arguments were spoken into radio-telephonic apparatus and carried to receiving stations everywhere in the Greater City, by which means they were heard by thousands of auditors scattered over a territory many miles in area.

The Youngest President of the A. I. E. E. — In the ELECTRICAL WORLD'S frontispiece sketch of Prof. Charles F. Scott, printed on Nov. 5, reference was made to his election to the presidency of the American Institute of Electrical Engineers in 1902, when he was only thirty-eight years old, and the distinction of having been the youngest of all the Institute presidents was accorded to him. This was an error. Young for such an honor as Mr. Scott was, a man even younger had previously had it conferred upon him, in 1887, when T. Commerford Martin, then in his thirty-first year, was chosen as the man fittest to head the body. Mr. Martin was the third president of the Institute and had already in those pioneer days begun the willing, vigorous and able service in his chosen field that he was for so long to continue.

Engineering Libraries.—The Special Libraries Association, a national body with offices in Washington, has found more than 1,300 "special" libraries in the country, many of which are largely concerned with engineering, technology, electricity, chemistry and industrial management. Engineering libraries of various types are maintained by national and local engineering societies, by colleges and universities, by large manufacturing companies, by professional engineering firms, by public utility companies and by various other agencies. Some of these libraries have been in existence for many years, but many others have only recently been established. The most complete and comprehensive collection is that of the Engineering Societies' Library in New York City. Thirty-six libraries devoted especially to electricity were found. As a result of the association's survey a "Special Libraries Directory" has been issued.

Oil-Immersed X-Ray Apparatus.—An important advance in the development of X-ray apparatus has lately been announced by Dr. W. D. Coolidge of the General Electric Company's research laboratory, in speaking before the American Roentgen Ray Society. Dr. Coolidge described new types of experimental outfits which have eliminated the danger of electric shock to patient or operator by complete isolation of high-tension sources within a grounded oil-filled metallic container. This receptacle contains the X-ray tube, a high-tension transformer and a Kearsley stabilizer, the whole weighing only 20 lb. The metal can is rotatably mounted in a steel-forked bracket giving thorough freedom of motion both vertically and horizontally through a considerable space and with just enough friction to hold it wherever put. The X-rays pass through the top of the sealed container and are focused by a "bakelite" tube attached to the container which also serves as a mechanical contact between the outfit and the patient. The small-sized apparatus for dental radiography operates on 40,000 volts and 10 milliamperes, and the larger apparatus for more general work on 60,000 volts and 50 milliamperes. The tube, which is of the self-rectifying type, is only 5.75 in. long, the smallest yet developed.

Current News and Notes

Timely items on electrical happenings throughout the world, together with brief notes of general interest.

Increased Capacity at Lowellville, Ohio.—Work has been begun by the Pennsylvania-Ohio Power & Light Company on the erection of an addition to the Lowellville (Ohio) generating station to house a new 20,000-hp. turbo-generator. This additional unit will bring the capacity of the Lowellville station to 80,000 hp. The greater part of the foundation work was completed some time ago. The need for an increased production at Lowellville has sprung up in the last four months, when industrial and commercial consumers of power have been added steadily in the Youngstown, Newcastle and Sharon districts. The power output in the four weeks ended Oct. 22 showed an increase of 25.5 per cent over the four-week period ended July 30.

Power Project for Lancashire District of England.—Plans for supplying electrical energy to the southeastern part of Lancashire, England, of which the city of Manchester is the center and which includes many smaller manufacturing towns, have been completed which, though they still lack municipal and parliamentary acceptance, will, it is thought, be finally adopted. By these plans it is hoped to save £250,000 in generating costs in ten years. Many existing central stations will, if the plan goes through, be put out of commission, but five or six will be extended and will co-operate with a great station that the Manchester Corporation is erecting at Barton. It is a curious fact, says the London *Engineer*, that within this great industrial area there is no waste heat available, either in the form of gas or of exhaust steam, for use in the generation of electricity, nor any water resources which can be utilized except for condensing purposes.

Electric Steamship Drive Scores Two More Successes.—The first electrically driven cutter in the United States Coast Guard—the Tampa—which takes the place of the boat of the same name torpedoed off the English coast in the last year of the war with a loss of all hands, has had her sea tests, and the drive is pronounced by her officers to be a complete success, especially as regards reversing and stopping the craft. From full speed ahead at better than 15 knots to a dead stop in less than the ship's length was her record. The best that any other cutter has done has been to stop within three ship's lengths, the boat's engineer said. A similar advantage was found in the case of the Victorious, the fifth of the 12,000-ton cargo carriers which are being equipped with electric drive for the United States Shipping Board at the Todd Shipyard Corporation's basin in Brooklyn, N. Y. The average speed attained by the Victorious during her trials showed a gain of 1.6 knots over her speed before the electric drive was installed. From full speed ahead, with the propeller turning at the rate of 100 revolutions a minute, full speed astern, with the propeller turning at the same rate, was accomplished in four seconds. The vessel was brought to a complete halt in two minutes and forty seconds.

University of Illinois Annual Electrical Show. — Plans for the annual electrical show to be given by faculty and students of the electrical engineering department of the University of Illinois have just been made. The show, which will be given next March or early in April, will be a notable exhibit of the most advanced ideas in electrical devices and merchandise. Since the close of the war these shows have been revived and marked interest has been demonstrated in them by faculty, students and the public generally.

Louisville's Electric Home.—Through the efforts of the Electric Club of Louisville, Ky., an electric home was opened to the public in that city on Oct. 24. This eight-room house, with an adjoining garage, has 105 outlets and forty-nine electric appliances including an electric victrola, clock, furnace-heat regulator, refrigerator and clothes drier. Such an interest was shown in this ideal home that during the first four days 9,000 people visited it and became acquainted with the possibilities of service offered by the public utilities.

Valuation of Ohio Utilities.—The 1921 tax valuation of Ohio electric light and power, natural gas, telephone and electric railway companies is $42,068,220 higher than the 1920 valuation, an increase of 8.2 per cent, according to figures compiled by the State Tax Commissioners and circulated by the Ohio Committee on Public Utility Information. The electric light and power, natural gas, telephone and electric railway companies paid $19,000,000 in taxes for 1920. The increased valuations, combined with higher rates in almost all of the counties, mean that more millions must be collected by these companies to pay their higher tax bill for 1921. Electric light and power companies received the biggest increase in their tax valuations, being boosted from $78,097,920 in 1920 to $93,285,450 this year, an increase of $15,187,530, or 19.4 per cent.

Progress of the Rhone Dam.—Preliminary work on the hydro-electric development upon the Rhone, in France, is proceeding satisfactorily, according to the *Engineer's* Paris correspondent. The most difficult part of the undertaking will be the Genissiat dam, which is to have a height of about 330 ft. and which it was feared might be imperiled by possible fissures in the underlying chalk strata. For nearly two years past an elaborate system of soundings and borings has been in progress. This work proved that the foundation for the dam would be perfectly sound. It is hoped that with the termination of the preliminary work it will be possible to proceed with the construction of the Compagnie Nationale de Rhône, which does not appear to be making so much headway as had been expected, first, on account of the financial situation generally and then because public opinion was influenced against it.

Recent Court Decisions

Findings of higher courts in legal cases involving electric light, power and other public utility companies

Decree Impounding Part of Customers' Payments Does Not Empower Commission to Fix Rate Retroactively.—In Consolidated Gas Company of New York vs. Attorney-General the United States Court for the Southern District of New York declared that a decree limiting the rate to be charged by a gas company and impounding a certain part of the money collected, to be later distributed according to a rate eventually determined by authority of the state, does not require that the power given to the Public Service Commission shall extend to fixing a rate to be effective retroactively. The time fixed by the decree for impounding was extended for three months after the determination of the appeal in order to give the Public Service Commission time to set a new rate. (274 Fed. 986.)*

Trade Associations May Exchange Price Lists and Other Data.—A point of interest to the three thousand trade associations existing in the United States was settled in the Federal District Court at Chicago when it was held that such associations may lawfully exchange price lists and other trade data. Suit had been brought against the Armstrong Bureau—maintained by thirteen manufacturers of linseed oil for purposes such as those named—as a part of the government's anti-trust prosecutions. "Logic which assumes that because there is an opportunity to fix prices, therefore prices are fixed, is contrary to the genius and logic of our law," said the court. "Every man is presumed to be innocent until he is proved guilty. If the Armstrong Bureau is to be dissolved merely because it afforded the members an opportunity to fix prices, then this court with equal propriety could be asked to dissolve any lunch club where business men meet. This theory hardly warrants discussion."

Federal Court Issues Restraining Order Permitting Increased Rates Temporarily.—In Northwestern Bell Telephone Company and Tri-State Telephone & Telegraph Company vs. Attorney-General, the United States District Court for the District of Minnesota has held that pending an application for an interlocutory injunction against the enforcement by state officials of existing telephone rates and an order of a state commission denying temporary increases where it appears that the existing rates are confiscatory, that the companies have been trying for several months to get temporary relief, and that every day's delay is important and perhaps vital and it cannot be told when the application for an interlocutory injunction can be heard by three judges as required by law, a temporary restraining order granting an increase in rates until the hearing of such application will be granted on conditions protecting customers in case it is finally determined that the increase ought not to have been granted. (274 Fed. 384.)

Contract Rights of Cities in South Dakota.—A preliminary injunction granted to the Water, Light & Power Company against the city of Hot Springs, S. D., was dissolved and the company's bill dismissed by the United States District Court, which held that the constitutional provision that "no law making any irrevocable grant of privileges, franchises or immunity shall be passed" was not violated by a city ordinance granting a franchise for a term of years to an electric company, including a rate contract. In granting a franchise to an electric company, the court held, a city may by a contract accepted by the company fix maximum rates of charge for a stated term, and this contract will be valid and binding during the term, regardless of the fact that the rates so fixed may be or may become confiscatory. (274 Fed. 827.)

*The left-hand numbers refer to the volume and the right-hand numbers to the page of the National Reporter System.

Commission Rulings

Important decisions of various state bodies involving or affecting electric light and power utilities

Funding Bond Discount.—The Indiana Public Service Commission, dismissing an application from the Wabash Valley Electric Company, has declared that a public utility is not permitted under the laws of the state to issue securities for the purpose of funding bond discount.

Motion-Picture Theater Allowed to Go on Power Schedule.—The New York Public Service Commission has granted the application of the Bellevue Theater Corporation for a power rate on the electrical energy used to operate its motion-picture projecting machine at Niagara Falls, instead of the lighting rate which had previously been charged by the Niagara Electric Service Corporation. The fact that the alternating-current energy delivered by the company had to be changed to direct current for the use of the theater was the ground on which the Bellevue corporation claimed the much lower rate now accorded to it.

Rates for Hauling Coal to Central Station Reduced.—The Public Service Commission of Pennsylvania has ordered the Lehigh & New England Railroad Company to reduce to 35 cents a ton its rates for hauling coal from Coaldale, Lansford. Nesquehoning and other places in that neighborhood to the plant of the Pennsylvania Power & Light Company at Hauto. This order sustains a complaint of the central-station company. In announcing its decision the commission said that the contention that the commission had no authority to change rates within the federal guarantee period was without merit. The rates of 40 and 70 cents in effect during the period covered by the complaint are set aside. In regard to a contention regarding switching service charges, the commission said there was no such thing as a foot-rule standard for switching and other charges comparable to that under attack.

Associations and Societies

A complete Directory of Electrical Associations is printed in the first issue of each month.

Institute Section Meetings.—Section meetings of the A. I. E. E. for next week are scheduled as follows: Nov. 25, Kansas City, "Diesel Engines," by C. E. Beck; Nov. 25, Toronto, "Instruments and Measurements."

Boston Section, A. I. E. E.—"Electric Waves and Their Application to Radio Telegraphy and Telephony" was the subject of an address before this section on Wednesday, Nov. 16, by Prof. E. Leon Chaffee of the Harvard Engineering School.

Western Inspectors Announce January Convention.—Announcement comes from the Western Association of Electrical Inspectors that the seventeenth annual convention of that association will be held in Chicago at the Hotel Sherman on Jan. 17, 18 and 19, 1922.

Engineers' Club of Philadelphia.—O. C. Merrill, executive secretary of the Federal Power Commission, will discuss "Accomplishments Under the Federal Water-Power Act" before this club at the luncheon on Tuesday, Nov. 22. On Nov. 29 Jacob Billikopf, founder of the Kansas City Board of Public Welfare, will be the speaker.

Dr. Hollis to Speak on Waste.—At the Philadelphia Chamber of Commerce on Monday, Nov. 28, at 8 p.m., Dr. Ira N. Hollis, president Worcester Polytechnic Institute, past-president A. S. M. E. and a member of the committee on the elimination of waste in industry appointed by Secretary of Commerce Hoover, will address a joint meeting of the Philadelphia Section of the Taylor Society, the Atlantic Chapter, Society of Industrial Engineers, and the Industrial Engineering Club on "Waste and Its Relation to the Industries."

Coming Meetings of Electrical and Other Technical Societies

A. I. E. E. Section Meetings—Kansas City, Nov. 25; Toronto, Nov. 25; Minnesota, Nov. 28; Atlanta, Nov. 30; Providence, Dec. 2; Baltimore, Dec. 8; New York, Dec. 14.

A. I. and S. E. E.—Pittsburgh Section, Nov. 21; Cleveland Section, Dec. 12; Chicago Section, Dec. 16; Philadelphia Section, Dec. 20.

Philadelphia Section, American Welding Society—Philadelphia, Nov. 21.

Kentucky Association of Public Utilities—Louisville, Nov. 22.

Philadelphia Chapter, American Society for Steel Treating—Philadelphia, Nov. 25.

American Physical Society—Chicago, Nov. 25-26; Toronto, Dec. 27-30.

Electrical Supply Jobbers' Association—Cleveland, Nov. 30, Dec. 1-2. Atlantic Division, Cleveland, Nov. 29.

American Society of Mechanical Engineers—New York, Dec. 5-9.

American Society of Refrigerating Engineers—New York, Dec. 5-7.

American Institute of Chemical Engineers—Baltimore, Dec. 6-9.

American Association for the Advancement of Science—Toronto, Dec. 27-31.

American Engineering Council — Washington, Jan. 5-6.

American Society of Civil Engineers—New York, Jan. 18-19.

National Meter Committee, N. E. L. A.—Springfield, Ill., Feb. 15.

Men of the Industry

Changes in Personnel—Responsibilities and Association Appointments of Men Engaged in Professional, Executive, Operating and Commercial Branches of the Industry

John N. Cadby, consulting engineer of Madison, Wis., has been selected as executive manager of the Wisconsin Electrical Association and will take office on March 1, 1922. Mr. Cadby comes to this important work after many years of intimate contact with the public utilities industry of Wisconsin. He was born in Merton, Wis., in 1880 and graduated from the Electrical Engineering College of Wisconsin University in 1903. During the years

J. N. CADBY

immediately following graduation Mr. Cadby was employed in designing, contracting, teaching and other engineering pursuits. In 1908 he joined the engineering staff of the Railroad Commission of Wisconsin and for the next ten years was in direct charge of the numerous regulatory operations undertaken by that commission relating to the gas, electric and telephone companies operating in Wisconsin. During these years he visited utilities in numerous cities outside the state to report on the practices and standards in force when no state commission was in existence. In recent years he has frequently been called upon to represent the commission at conferences with the national engineering and public utilities associations and to describe the work of the Wisconsin commission both in technical publications and before such conventions. One example of Mr. Cadby's pioneering work is the Wisconsin telephone standards of service in force since 1914. In 1917 he resigned from the commission's staff and opened a consulting engineering office.

O. G. Gillett has been appointed superintendent of the South Meadow station of the Hartford (Conn.) Electric Light Company, and F. V. Whitney has been appointed to the same post at the Dutch Point station of the same company. Both will report to F. M. Wilbraham, superintendent of power.

Prof. Walther Nernst of the University of Berlin has been awarded the Nobel prize for 1920 in chemistry by the Swedish Academy. Professor Nernst is one of the best known physical chemists in Germany and was awarded the iron cross of the first class for distinguished service of a scientific character for the German army. He is probably best known, however, as the inventor of the Nernst incandescent lamp, which appeared at one time to be about to enter into universal use but was superseded by the tungsten lamp. Dr. Nernst has contributed to the technical press many papers on scientific, physical and electrochemical topics, based upon his original researches.

Philip Torchio, chief electrical engineer of the New York Edison Company, who has been abroad for two and a half months observing engineering developments in Italy, France and England, returned to this country recently. He also visited northern Africa, but most of his time was occupied in Naples, Rome, Florence, Venice, Milan, Paris, London and Birmingham. Mr. Torchio's recent work has been chiefly the development of methods which will increase the reliability and continuity of electric service from central-station systems. Toward this end he has contributed considerably to the industry, he having been responsible for the introduction of thin-plate storage batteries for central-station standby service and being the patentee of various important devices used in connection with underground transmission, such as high-tension cable-joint construction, ground and fault detectors, insulating covering for cables, manhole circuit breakers, reactance coils and protective devices for busbars and cable joints. Although usually associated with the direct-current system of the New York Edison Company, Mr. Torchio has also been closely identified as consulting engineer with the development of the extensive alternating-current network in and around New York City.

S. E. Wolff, well known as a public utility valuation and rate expert, has been elected vice-president of the United States Food Products Corporation. Mr. Wolff is a Western man, having been born and educated in Michigan, where he spent his earlier business life in the operation of public utility and railroad properties. In 1903 he became general manager of the Jackson (Mich.) Gas Company and two years later became vice-president and also vice-president and general manager of the gas, electric light and power and city traction properties in Saginaw and Bay City and the interurban road connecting these cities. In 1908 he removed to New York City and was engaged in the executive offices of Hodenpyl, Walbridge & Company, principally in examination and reports on properties and the reorganization of working forces of such properties as were acquired. He remained with this company until 1911, when it was succeeded by Hodenpyl, Hardy & Company, Inc., for whom he has been constantly engaged in examinations of organizations of working forces and management of corporations, principally public utilities, but embracing also railroad, manufacturing and mining properties. In 1917 he entered the army and was assigned to the Signal Corps and later to the Bureau of Aircraft Production, where he served as the head of the finance division. On his discharge from the army he resumed his duties with Hodenpyl, Hardy & Company.

G. C. Neff, chairman of the newly formed farm-life committee of the National Electric Light Association, is a native of Indiana and a graduate from Purdue University, class of 1907. After short periods of employment with the American Bridge Company and the Sandusky Portland Cement Company,

G. C. NEFF

he became the resident engineer on the location and construction of a 68-mile, 44-kv., double-circuit, three-phase transmission line in Wisconsin. On the completion of the line he became the superintendent of construction on the Portage transformer and frequency-changer substation. In 1910 he took the superintendency of the Southern Wisconsin Power Company, and in 1914 was made the general superintendent of the Southern Wisconsin Power Company and Wisconsin River Power Company. To these duties were added those of general superintendent of the Wisconsin Power, Light & Heat Company and Central Wisconsin Utilities Company in 1918, the Mineral Point Public Service Company in 1919 and the Janesville Electric Company in 1921. The six companies own and operate hydro-electric and steam plants with a combined capacity in excess of 50,000 kw., generate annually over 120,000,000 kw.-hr. of electrical energy and serve fifty-five communities in central and southern Wisconsin. He has been a member of the overhead systems and inductive-interference committees of the National Electric Light Association since 1920 and was chairman of the Madison Section of the A. I. E. E. in 1920. He is chairman of the rural lines extension committee of the Wisconsin Electrical Association, which has been one of the leaders in formulating rural extensions rules and policies.

E. R. Johnson of Minneapolis has been engaged by the Ideal Electric & Manufacturing Company of Mansfield, Ohio, to take entire charge of all synchronous-motor sales.

Bernard R. Hensel has been selected by the Los Angeles contractor-dealers to represent them on the joint committee which will direct the new activity of the California Electrical Co-operative Campaign looking toward closer co-operation with the building industry in southern California.

C. H. Mackelfresh has opened a new district office in Cincinnati, Ohio, at 6 Greenwood Building, for the Railway & Industrial Engineering Company of Greensburg, Pa. Mr. Mackelfresh is a graduate of the College of the University of Cincinnati, class of 1909. For several years past he has been connected with the supply department of the Westinghouse Electric & Manufacturing Company, having been previously engaged in central-station and general engineering work.

T. D. MacMullen, secretary and sales manager of the Majestic Electric Development Company of San Francisco, is the chairman of a committee preparing an electrical exhibit for the coming Industrial Exposition at San Francisco. Mr. MacMullen, whose company, organized in 1914, has expanded until it now has a branch factory in Philadelphia, has been active in the affairs of the N. E. L. A., the Electrical Development League and the California Electrical Co-operative Campaign, as well as taking part in civic and general industrial affairs.

Edward M. Eliot has been appointed assistant to the vice-presidency of the Underfeed Stoker Company of America. He has previously been service manager for the Diamond Power Specialty Company, Detroit. Mr. Eliot was engaged in power-plant design and construction for eight years with the Oregon Electric Railway Company, the Electric Bond & Share Company and other companies and for the last seven years has specialized in the organization of service work and repair sales. He is a graduate of Massachusetts Institute of Technology.

Martin J. Wolf, until recently vice-president and sales manager of W. N. Matthews & Brother, Inc., of St. Louis, has been appointed sales manager of the Bussmann Manufacturing Company of that city. Mr. Wolf entered the electrical field in 1910 with the Hobson Electric Company of Dallas, Tex., as assistant sales manager. Early in 1913 he went to Chicago as sales manager of the Hot Point Electric Heating Company. His aggressive methods in connection with this organization in some measure were responsible for its remarkable success in the merchandising of electrical appliances. In 1914 Mr. Wolf joined the organization of W. N. Matthews & Brother, as manager of sales, becoming vice-president and a director in 1916. In this company he retains his identity as an officer and stockholder. Mr. Wolf has always been an exponent of vigorous but strictly ethical sales policies, and has preached and practiced co-operation between the various elements of the electrical industry. He is a close student of business administration, business economics and the psychology of salesmanship and has lectured upon the last-named subject before business, fraternal and civic organizations in many parts of the country.

W. P. L'Hommedieu, manager of the power department, San Francisco district, Westinghouse Electric & Manufacturing Company, has been elected chairman of the San Francisco Section of the American Institute of Electrical Engineers. Mr. L'Hommedieu has been an untiring factor in the promotion of Institute and engineering interests in central California and has helped to strengthen the power industry of that section in its commercial aspects. For three years he has been on the executive committee of the local section of the A. I. E. E. and he is serving for the fourth time on the engineering committee of the Pacific Coast Geographic Division of the N. E. L. A.

G. R. Watson, formerly Cincinnati representative of the Crouse-Hinds Company, has just been made sales manager of the Wadsworth Electric Manufacturing Company. For seven years he was electrical supervisor of the Pullman Car Company in Chicago.

G. R. WATSON

The next three years were spent as assistant to the New York manager of the Crouse-Hinds Company, after which he took up the work in Cincinnati from which he has just resigned.

J. G. Sharp, head of the works financial division of the Western Electric Company at Hawthorne, has recently been made assistant treasurer. Mr. Sharp's Western Electric career began in October, 1893, at Chicago, where he was hired in the old Clinton Street factory by J. Mason Jackson, then secretary and treasurer of the company. For the first few years Mr. Sharp was switched about through several positions to afford him an acquaintance with the company's shops and business methods. About 1896 he was put in charge of the time office, to which payroll work was added in 1898. During 1901 and 1902 he was chief of the machine expense and time-posting department. The following year he had charge of shop costs. On Oct. 15, 1904, he took the helm in the ticket auditing and record room, being transferred to Hawthorne in the same capacity four years later. He was made cashier and head paymaster at Hawthorne in December, 1910, and chief of the financial division in April, 1917. His appointment as assistant treasurer took effect on June 14 last.

H. E. Rice, commercial manager of the Atwater-Kent Manufacturing Company, has resigned that post to become associated with the American Bosch Magneto Corporation as assistant to the president. Mr. Rice, who was with the Atwater-Kent company for nearly twelve years, has a business experience in the electrical and engineering field covering a period of more than twenty years. Trained as an electrical and mechanical engineer, he has held positions of responsibility in different electrical manufacturing organizations and for a long period devoted himself to experimental and development work in connection with electrical instruments, measuring devices, signaling equipment and small refrigerating machinery. On leaving his former associates he was presented with a gold watch. In the American Bosch organization Mr. Rice will be closely identified with the intensive and substantial sales and engineering program of the new organization in connection with the lighting, starting and ignition equipment now included among its products.

Obituary

Rayner M. Bedell, an electrical engineer in the laboratories of Peter Cooper Hewitt until Mr. Hewitt's death in Paris last August, died of tetanus Nov. 5, at Montclair, N. J. He was forty-one years old and a graduate of Cornell University, class of 1902. Mr. Bedell was a candidate for the Assembly on the single-tax ticket in the recent election.

John A. Perkins, who died on Oct. 27 from apoplexy, while on a hunting trip near his home at Lockport, N. Y., was well known both in the electrical field and in the gas industry. His capacity for hard work and his mastery of the industries with which he was identified earned for him the highest esteem of public utility men. Mr. Perkins was born in South Bend, Ind., Sept. 2, 1877. At the age of sixteen he entered the employ of the South Bend & Mishawaka Gas Company, of which his father had been the manager some years before. He stayed with this company sixteen years, working up through the organization step by step, and by the time he left South Bend in 1906 he had a knowledge of the gas business probably second to that of no man in the industry. With this background Mr. Perkins joined the United Gas & Electric Engineering Corporation as superintendent of the gas department of the Altoona (Pa.) Gas Light Company. Two years later he was sent to the Richmond (Ind.) Light, Heat & Power Company as general manager. In 1910 he went to Bloomington, Ill., as general manager of the Union Gas & Electric Company, and in May, 1916, he became general manager of the Lockport Light, Heat & Power Company. Later he became vice-president of the company as well as general manager, which positions he held at his death. Mr. Perkins was not only an executive but a leader and companion of the men working for him. He possessed two great business qualifications —an apparently inexhaustible fund of energy and a capacity for mastering, applying and enjoying detailed knowledge and experience.

Trade and Market Conditions

Business Reviews, Together with Market Letters from Important Trade Centers, on the Supply, Demand and Prevailing Prices of Electrical Apparatus and Supplies

Foreign Heating Appliance Imports Attracting Attention

REPORTS emanating from various sources in the electrical industry indicate that there are a considerable number of foreign-made heating devices being brought into this country. Actual figures on the numbers being brought in are not available, some authorities frankly stating that they have no idea what they are, while others are positive that the numbers are very great. For instance, one manufacturer in Connecticut has recently declared that a shipment of German-made electric flatirons, numbering 500,000, has been brought into this country since the first of August. Most of these devices, it is understood, are coming in from Germany, while a few are imported from Austria.

The present import duty on articles of this sort is only 20 per cent of the foreign prices and inasmuch as German flatirons, for instance, are reported to be sold at wholesale in this country for from $1.32 to $1.75, it can be seen that even a 100 per cent ad valorem import duty would not suffice to bring these articles up to American price levels.

So far only the following devices have been brought to the attention of American manufacturers: An electric flatiron weighing 6 lb., a traveling iron in leather case weighing 2 lb., a cooking kettle and water heater with a capacity of 1½ kg., several types of disk stoves and a reflector heater. The heating unit in the 6-lb. flatiron has been analyzed, and it has been found that this unit contained nickel chromium alloy. The use of this alloy in heating appliances as a heating element is covered in the United States by the Marsh patent, and the owners of the patent have announced that they intend to do everything necessary to protect not only their interests but those of the licensees.

The retail selling price of these products averages lower than prices of similar products of American make, the 6-lb. flatiron selling for $3.95, the 2-lb. traveler's iron in leather case for $6.50, and the water heaters and cooking kettles for $5.

Spain Best 1920 Customer for Control Devices

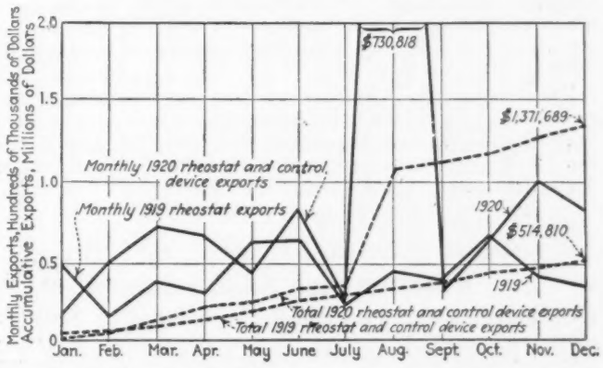
A STUDY of the exports of control devices, including rheostats, for the calendar year 1920 reveals some interesting figures in regard to the foreign markets for this class of material. The value of the exports for the year was $1,371,689, an increase of 167 per cent over the exports of the year 1919, when they amounted to $514,760. The increase over 1918 is even more marked, the value for that year being $288,757, so that 1920 was 376 per cent in advance.

In the accompanying table, figures for which were complied by the ELECTRICAL WORLD from data received from the Bureau of Foreign and Domestic Commerce, it is shown that in the year 1920 only fourteen countries imported American-made rheostats and control devices in amounts over $15,000. These countries took practically 94½ per cent of the American exports, while South American countries, excluding Brazil, took 3½ per cent, and thirty-three other countries took the remaining 2 per cent divided between them.

RHEOSTATS AND MOTOR CONTROL APPARATUS EXPORTS IN 1920

Spain	$727,140	France	$29,490
Canada	95,673	Australia	28,336
Japan	92,945	Italy	25,609
Belgium	52,367	New Zealand	22,339
Cuba	51,255	Brazil	21,395
England	48,860	Mexico	18,509
South America (excluding Brazil)	46,433	Thirty-three other countries importing control devices	34,921
British India	39,190		
Norway	37,227		
Total			$1,371,689

European countries took $920,693 worth, or over 66 per cent of the total. Spain proved by far the most important customer of the year, buying $727,140 worth, this being 52 per cent of the total exports to all countries. The greater part of this amount, or $703,128 worth, was purchased in the month of August and was evidently intended for one or several large installations, since exports to that country were not particularly high in other months. Canada was a poor second in yearly total, taking $95,673 worth,



AUGUST, 1920, EXPORTS NEAR TOTAL FOR TWO PREVIOUS YEARS

but proved to be one of our best month-to-month customers. Japan was only slightly behind Canada, with $92,945. Only small amounts separate the rest of the countries on the list. Departing from her relative position in the importation of other electrical commodities, Mexico is at the foot of the list of countries importing rheostats. It is interesting to note that British India stands comparatively high in imports of this sort of equipment, having purchased $39,190 worth from the United States. This would indicate that that part of the Orient is a better market for electrical equipment than has been commonly supposed.

In general the curves of monthly exports for 1920 and 1919 followed each other closely. The only great divergence is noticeable in August, that month in 1920 including the large shipment to Spain. November and December, 1920, showed some increase over the same months in 1919.

Basic Conditions Show Betterment

SINCE the first of the year there has been a widespread belief among business men that one of the first and best indications of returning prosperity would be heavy buying by the large railroad corporations. According to this an era of good business is at hand, as railroad buying, since the last week in October, has been exceptionally heavy. Orders have been booked or are soon to be placed, mostly by Western roads, for 105 locomotives and more than 13,000 cars, valued at approximately $32,000,000. There have also been inquiries for up to 400,000 tons of steel rails. This buying, which in reality is larger than normal for the roads concerned, may well be accepted as a sign that things are improving, for unless they were able to see a distinct upward trend to their traffic and to business in general, there is no

reason to suppose that they would be making such active preparation.

Another straw to show the way the wind is blowing is the issuance by municipalities of $94,000,000 worth of bonds. More than $60,000,000 in municipal bonds have been disposed of recently in thirteen states, and more than $34,000,000 worth in addition have been offered for sale. Besides this, $10,000,000 worth of state bonds have been sold, and an equal amount has been offered for sale. This comes as a result of lowered interest rates, and it shows better opportunities for industrial securities also. These municipal and state bonds mean an almost immediate aid to business in the form of construction of schools, filtration plants, waterworks, bridges, lighting systems, court houses and municipal light and power plants.

One more very favorable sign is the large number of building contracts let during the last two months. Figures just compiled by the F. W. Dodge Company show that October contracts were 25 per cent greater than those for October, 1920, and only 10 per cent under September, 1921, which was a record month. The total value of the month's contracts was $222,480,000. Considering the large volume of construction started in the past eight weeks, it appears that activity will continue at a very substantial rate through the winter months, an outlook which is particularly inviting to manufacturers and distributers of electrical and building supplies. According to the statement of the Dodge company, residential building continued to lead in importance, but industrial building showed a large increase, being 63 per cent ahead of September.

Taking all these hopeful signs into consideration, representative men in electrical circles and business men in general express themselves as satisfied with the trend, and the opinion seems to be common that the improvement is not a flurry but will be gradual and lasting.

Motor Situation Improving with Popular Size Stocks Low

SALES of industrial electric motors up to 50 hp. have improved somewhat during the last sixty days, according to a statement made to a representative of the ELECTRICAL WORLD by a sales executive of a leading motor manufacturer. It is his belief that the improvement is due as much to strenuous sales efforts as it is to a general improvement in business conditions, inasmuch as the sales are being distributed equally well over dozens of industries, no one industry showing any extraordinary demand. The sales curves for the Eastern territory are about 10 per cent under 1919 to date, and while other sections of the country may not have done quite so well, their records will compare favorably with the 1919 records. However, he stated, motor business for the first ten months of 1921 shows a decrease of approximately 20 to 25 per cent from the same period of 1920.

During the summer it was felt that the large stock of motors in the hands of used-motor distributors would take a very long time to move, but it has been found that the stocks of second-hand popular sizes are getting low and the effect is being felt in the movement of popular sizes from the manufacturer. The same condition is found in contractor-dealers' stocks, and some contractor-dealers are starting to buy the popular sizes. Motors of special types and sizes are having their usually slow movement, and second-hand contractor-dealer stocks of these are still heavy.

The condition of the fractional-horsepower-motor market remains bad, he continued, but there has been some betterment, due mainly to increasing production of washing machines. Motor manufacturers feel that the outlook for the washing-machine industry is one of the brightest spots in business. One particular manufacturer of washing machines in the Middle West reports better business during October than in any month since the first of the year, and this condition is thought to be fairly general.

The question of prices is one which is engaging some attention, but, according to this manufacturer, it is difficult to find a basis for much of a reduction. The costs of raw material and labor are fairly low, he declared, but nearly all manufacturers have to contend with overhead expenses, which are greatly increased as compared with pre-war conditions. A chart, based on July, 1921, figures, shows prices to be slightly over 20 per cent ahead of the 1915 price level, while the average of all commodities stands at 60 per cent ahead of 1915 levels. Manufacturers, therefore, are looking forward to a reduction in freight rates as the most logical method of reducing their prices.

Conduit Prices High in Southeast

INVESTIGATION by a representative of the ELECTRICAL WORLD discloses the fact that jobbers' prices on rigid iron conduit in the Southeastern section of the country are unstable but will average higher than those quoted in the Middle West, New England and the New York territory. A few jobbers in Atlanta are quoting the following prices in lots under 2,500 ft. to the contractor trade: Black, ½-in., $7.22; ¾-in., $9.42; 1-in., $13.58, and 2-in., $29.56 per 100 ft. Galvanized is being quoted at $7.64, $10, $14.44 and $31.40 per 100 ft. on the same sizes respectively. This is about 50 per cent higher than the quotation in Chicago, where the ½-in. black conduit is quoted at $4.82 per 100 ft. in lots of 1,000 ft., and about 40 per cent higher than the New York price, the quotation there being $5.08 per 100 ft. in lots of 1,000 ft. Other large jobbers there are making a somewhat lower price on lots of over 2,500 ft., the lowest price being $6.28 per 100 ft. of ½-in black, in less than carload lots. In other parts of the territory prices are generally lower, but the average for the whole territory is higher than in any other section of the country. There is, however, a tendency on the part of smaller jobbers to make sharp cuts in order to move stocks of certain sizes. A canvass of Southeastern jobbers shows that on small lots the average jobbers expect to make a gross profit of from 12 to 18 per cent.

There is no unusual demand in the section for conduit, though it is moving very satisfactorily in popular sizes. While improved conditions are to be noted all over the section as a result of the higher prices of cotton, the increase has not been sufficient for boom conditions anywhere in the territory. Additional freight charges, it is stated, will account for some increase in the Southeastern market price over those of New York and Chicago.

Metal Market Situation

THE week opened with a strong market with prices ⅛ cent to ¼ cent higher than last week. Some producers are taking only a few orders at 13¾ to 13⅞ cents delivered per pound, and two large ones have gone out of the market entirely. The market is partially controlled by the producers, but a sharp price increase is not looked for as it would be unhealthy for the industry in the end. Domestic demand remains active in the anticipation of higher prices about the first of the year. One of the brightest spots in the industry is the larger buying of copper by brass manufacturers in the last two weeks. Most of them are said to have covered their requirements for the rest of the year, some even for January and February. Foreign sales are fair with Germany, France, Japan and England prominent among the buyers.

NEW YORK METAL MARKET PRICES

	Nov. 7, 1921	Nov. 14, 1921
	£ s d	£ s d
Copper		
London, standard spot	66 0 0	67 0 0
	Cents per Pound	Cents per Pound
Prime Lake	13.25	13.25
Electrolytic	12.50	13.12½
Casting	12.37½	12.37½
Wire base	14.50	14.75
Lead, Am. S. & R. Co. price	4.70	4.70
Antimony	4.70	4.70
Nickel, ingot	41.00	41.00
Sheet zinc, f. o. b. smelter	10.00	9.00
Zinc, spot	5.20—5.25	5.20—5.25
Tin, Straits	28.62½	28.75
Aluminum, 98 to 99 per cent	24.50	24.50

OLD METALS

	Cents per Pound	Cents per Pound
Heavy copper and wire	10.50 —10.87½	10.50 —10.87½
Brass, heavy	5.00 — 5.25	5.00 — 5.25
Brass, light	4.75 — 4.87½	4.75 — 5.00
Lead, heavy	3.75 — 4.12½	3.75 — 4.12½
Zinc, old scrap	2.00 — 2.25	2.50 — 2.75

THE WEEK
IN TRADE

Prices When Quoted Are Those Prevailing at the Opening of Business on Monday of This Week for Points West of the Mississippi River and on Tuesday for All Eastern Points

BUSINESS in all sections of the country seems to be well sustained, but there are very few high spots. Construction is active in New England, New York, the Middle West and the South, a great deal of it being of the residential type though there are quite a few industrial projects being considered. There have been only a few price changes, including a 10 per cent cut on watt-hour meters, and a 10 per cent additional discount on locknuts and bushings. Boston reports a slight softening of prices on pole-line hardware and rigid conduit.

Washing machines are reported to be moving sluggishly in New York but manufacturers declare October was a good month and dealers in other cities are having good sales. Vacuum cleaner sales are good while heating device movement seems somewhat spotty.

St. Louis jobbers are finding a good market in Arkansas where municipalities are buying for light and power plants. Outside of that state, however, line material does not appear to be moving fast. Transcontinental freight rate cuts have been announced in San Francisco but not on any electrical items as yet.

NEW YORK

Jobbers report that activity in electrical lines is being well sustained and that there is a good current demand for wiring supplies and schedule material. This is attributed partly to a gradual increase in building operations, and indications point to their continuation through the winter. Jobbers and contractor-dealers are going ahead with more confidence, and they are of the opinion that conditions will continue to improve for the remainder of the year. Stocks generally are kept moderate but are sufficient to meet the demand with the exception of flexible armored conductor, of which there is still a shortage.

Heating appliances, household devices and hollow ware are moving fairly well. However, jobbers and dealers are both ordering carefully. Of the large appliances vacuum cleaners are in most active demand. One jobber reports having handled nearly 1,000 during the past month and finds the market still very good. Washing machines are moving somewhat sluggishly here.

Conduit.—Prices on this material remain virtually the same as last week. Jobbers quoted the following prices: For ½-in. black pipe in 2,500-ft. lots, $48.29; ¾-in., $62.06, and 1-in., $88.51 per 1,000 ft. Galvanized pipe in the same sizes was quoted at $53.19, $55.93 and $98.19. Jobbers, stocks are ample to meet the present demand.

Rubber-Covered Wire.—Little change has been reported in the condition of the wire market. Demand is moderate. No. 14 rubber-covered is quoted at $6.50 to $6.77 per 1,000 ft. in 5,000-ft. lots, although on orders for larger quantities it is understood that these prices have been shaded slightly.

Flexible Armored Conductor.—Shortage of armored conductor is not quite so acute as last week, but jobbers' stocks are still very low and orders for large quantities cannot be accepted with a definite date of delivery. No. 14, two-wire, single-strip, is quoted at $44.50 to $46 per 1,000 ft. in lots of that quantity. Double-strip is quoted at $46.50 to $48 per 1,000 ft.

Lamps.—All jobbers report that their lamp sales have been very satisfactory this year. The gas-filled lamps are becoming more popular in all sizes. Commercial unit-type fixtures have been moving very well, and the demand for industrial fixtures is increasing.

Loom.—Demand is very light and stocks are purposely kept small. No change in price has been noted. The 5/32-in. size is quoted at $16.50 per 1,000 ft. and the ¼-in. size at $18 per 1,000 ft. in that quantity.

Locknuts and Bushings.—An additional 10 per cent discount on locknuts and bushings was announced by a leading manufacturer this week. Formerly the maximum discount to the trade in standard package lots was 75 per cent off list. Jobbers are now quoting a maximum discount of 75 and 10 per cent.

Vacuum Cleaners.—There has been a brisk demand for cleaners this fall. One jobber reports sales of 1,000 cleaners since Oct. 1 and has placed orders for 10,000 additional for immediate delivery.

CHICAGO

Sales of electrical equipment have been steady this week, especially of wiring materials for use in the construction of residences in the suburbs and also for apartments in the city. This activity has developed into a greater magnitude than is generally realized. Jobbers are aware of this situation and competition is very keen so that prices quoted by several dealers vary from 10 to 15 per cent. An index of this building activity is given by the number of permits issued for the month up to Nov. 10 reaching 188, with a valuation of $3,434,800. This is an increase of 123 over the same period last year.

A significant movement in the building controversy was made this week by completion of the organization of the committee of more than 150 men representing civic and business organizations. The avowed purpose is full support to contractors, labor organizations and material dealers who observe the Landis award and the outlawing of organizations that refuse to support it.

Wire.—Jobbers report good sales on No. 14 rubber-covered this week, which is indicative of building activity in the suburbs. The price on this material varies from $6.60 to $6.75 per 1,000 ft. in 5,000-ft. lots. The base on bare wire remains 16½ cents and the demand is fair to good. Weatherproof is also selling for 16½ cents a pound in 1,000-lb. lots and is moving well.

Flexible Armored Conductor.—Demand is reported brisk, and No. 14 two-wire, double-strip, is selling at prices ranging from $48 to $52.50 per 1,000 ft. in 5,000-ft. lots. Stocks are fair, but in most cases not excessive.

Conduit.—Movement on conduit has been steady during the past week, but there has been no price change. A representative price on ½-in. black pipe runs from $47 to $49 per 1,000 ft. The same size in galvanized pipe costs between $51 and $52.

Lamp Cord.—This material is keeping pace with the sale of portable lamps and heating devices. The 3/64-in. insulation, No. 18 cotton, twisted, sells for $13.50 per 1,000 ft.; the 5/32-in. insulation in the same size and material sells for $19.72 per 1,000 ft. The silk-covered, twisted, No. 18, costs between $24 and $26 per 1,000 ft.

Loom.—The demand is very poor and jobbers are not overstocked. In 1,000-ft. lots the 5/32-in. size sells for $16 and the ¼-in. size for $18.50.

Washers and Cleaners.—Dealers report fairly good sales because of intensive sales effort which overcame the disturbing effect of the recent price cuts. More attention is paid to quality characteristics of the sale than to attempting to procure quantity sales. Dealers' stocks are sufficient to supply the trade.

Safety Knife Switch.—Trade on this switch is also brisk and jobbers report stocks ample. A representative price on a 30-amp. two-pole safety switch is $1.75.

High-Tension Equipment.—Activity in the steel mills is reacting on a manufacturer of high-tension equipment, who reports sales of outdoor substations to the mills. Another manufacturer has sold seventy-five 15,000-volt lightning arresters to southern California and about sixty 100-amp. 25,000-volt fuses to Australia.

BOSTON

Trade runs along without much change in volume at present, but small-order business is well sustained and comparisons with earlier periods this year reflect improved conditions. Central-station outputs in a number of cases show substantial gains over corresponding weeks of 1920. Building and engineering contracts for the week ended Nov. 8 in New England totaled $4,361,000, comparing favorably with most pre-war years and exceeding many weekly records of the past summer. Stocks in jobbers' warehouses are not accumulating to any extent, nor are orders on the factories being placed for much more than current requirements. Prices softened somewhat last week on pole-line hardware and rigid conduit.

Motors.—Small-order business features the market, with good stocks and steady prices. Deliveries are easy.

Electric Radiators.—Moderate sales are being made, owing to mild weather. These devices are gradually getting into the staple class, however, and their seasonal popularity is increasing. Stocks are ample for present requirements.

Wire.—Rubber-covered No. 14 wire sold Monday at $6 to $6.25 per 1,000 ft., in 5,000-ft. lots, with close competition and fair movement. Demand for weather-proof is quieter and not much bare wire is moving, despite upward tendencies in base prices.

Lamps.—Sales are excellent and on mill-type lamps of 25 watts and 50 watts rating there has been a slight shortage until very recently. Deliveries ran between three and five weeks, but some sales are now going through on a ten-day delivery basis. The demand for lamps is very diversified and commercial exhibits are yielding good returns.

Farm-Lighting Sets.—Last year's sales are being exceeded in New England, and the summer-cottage business has been good until lately. Stocks are very satisfactory, one dealer reporting more than two carloads on hand ready for immediate deliveries. A representative outfit of 300-watts rating and an 80-amp.-hr. battery sells for $250.

Rigid Conduit.—Demand is not very active, but prices are easier, approximately 5 per cent lower than a week or two ago. On less than 5,000 lb. the following prices were reported Monday: Galvanized, ¾-in., $77.22 per 1,000 ft., and black, $71.84; galvanized, ½-in., $59.63 and black, $54.53, per 1,000 ft. Shipments are coming through easily.

Fixtures.—Business is much better than earlier in the year, but it still suffers from small orders multiplied by diversified buyers, so to speak. It is felt that when building activities improve more, the fixture trade will respond.

Porcelain.—Stocks appear to have recovered from the recent flurry which took effect in a shortage in some quarters where "Nail-it" knobs were wanted. The current quotation is $18.50 per 1,000 in barrel lots.

ATLANTA

This week has brought a noticeable increase in the number of inquiries being received by the more substantial contracting firms in this section for estimates on large industrial plant undertakings. One of the more prominent jobbers reports having all the inquiries and work that he can handle, while sixty days ago he had little work on hand. The report for Georgia of the United States Department of Agriculture, while disappointing in some respects, sounds a real note of optimism regarding the outlook in the rural districts, particular attention being called to the growing tendency toward a greater diversification of crops throughout the state. Residential and commercial building continues active, and some heavy construction in industrial lines is at last beginning to get under way. Interviews with bankers seem to indicate that the sections of north Georgia and Georgia south of Macon are the most prosperous at this time, there being, however, a belt running from a few miles south of Atlanta to Macon in which conditions are rather unsatisfactory. A close survey seems to indicate that approximately 35 per cent of all commercial paper will be liquidated when due, but bankers and mercantile institutions will be forced to renew the remaining 65 per cent.

Vacuum Cleaners.—Campaigns on the part of one or two of the larger jobbers have been productive of good results in this line, purchases by retailers being heavier than for some time past. Stocks are in good condition with shipments satisfactory. No recent change in price is reported.

Electric Churns.—These continue to move fairly well, especially in the smaller towns, though few are sold in the large cities. Stocks are only fair and prices remain firm.

Lead Cable.—Varnished-cambric cable is moving very slowly, but duplex lead-covered cable sales are reported as fairly good in the larger centers. Local sticks are fair.

Commercial Lighting Fixtures.—The completion of schools and municipal buildings is doing much to sustain the excellent demand for this line. The demand is for both the moderate and the high-priced types, the semi-indirect unit being very popular. Local stocks are in good shape.

Flexible Non-Metallic Conduit.—The movement of this item continues rather sluggish, with the price on ¾-in. at $18 per 1,000 ft. Stocks are in good condition.

Tape.—The movement in this line continues to hold up satisfactorily, the buying of the duplex variety becoming more noticeable. Prices, friction, 100-lb. lots, 30 cents per pound; duplex, 75 cents per pound.

Air Heaters.—Apparently sales in this line have come to a standstill and present prospects are that the larger jobbers will have about a 30 per cent carry-over, despite their efforts to clean up their holdings.

Distributing Transformers.—An increase in the demand for the popular sizes has been noted for the past few weeks. The recent storm in Florida is responsible for heavy orders being received from the companies that suffered damages to distribution lines. Local stocks are in fair to good condition. There is an increase also to be noted in the sales of high-tension transformers for industrial plant operation.

ST. LOUIS

Building permits here for the month of October amounted to $1,557,173, as compared with $1,055,730 for the same month of last year. No large jobs were included, as was the case in September, but the construction of factories and workshops showed a better tone, the money value represented by them being larger than for any preceding month since July, 1920. Virtually all of the permits were for residences, and very healthy progress is observed in that field.

To reduce non-employment and to further building the St. Louis Building Trades Council and the contractors are in conference to work out a scheme for reduced wages if a substantial increase in building can thereby be effected. Prospects for some adjustment are more promising than they have been for some time, and it is understood that work aggregating about $20,000,000 awaits only lower construction costs.

More buying strength on the part of the municipalities in Arkansas is apparent, a number having plans under way for either new power plants or additions to their present equipment. The situation will be further improved by the $1,000,000 loan of the War Finance Corporation to the Arkansas Rice Growers' Association, as has just been announced. This money is to be used for promoting the milling and marketing of rice.

Meters.—A reduction in price of about 10 per cent was made effective Nov. 7 on both direct-current and alternating-current watt-hour meters. They have been moving well, particularly the residential lighting type, and stocks are maintained in good condition. The three-wire residential type is selling for about $8.50.

Transformers.—Movement of distribution transformers is not keeping pace with meters, as stocks in the hands of utilities were larger and line extensions had previously been made to care for the coming winter load.

Lightning Arresters.—A few small sales of the compression chamber type are being made, but utilities are now very well supplied with their requirements and virtually no additional protection is being installed on existing circuits.

Portable Drills and Hammers.—This business is noticeably

quieter. The numerous inquiries on hand some time ago did not develop into sizable orders.

Insulators.—Immediate factory shipments can now be given for all ordinary orders. There are numerous inquiries and orders, but they are all for small lots. Utilities are not buying as well as a few weeks ago, there being a decline in the amount of small extension work in the surrounding territory.

Cross-Arms.—Sales are slower, though there are a number of inquiries for good amounts. Representative prices of fir arms, size 3½-in x 4¼-in., are: 3-ft., $40.43 per 100; 4-ft., $53.90; 6-ft., $80.86; 10-ft., $135, all f.o.b. St. Louis.

Motors.—Considerable improvement in demand was experienced last week, the demand being for sizes up to 50 hp. There is some demand for fractional motors, but it is comparatively quiet. A large manufacturer reports sales as being about 50 per cent of normal.

Hollow Ware.—Jobbers report that buying by dealers for the holiday trade is slowly getting under way. A good business is predicted, and stocks are ample.

Farm-Lighting Outfits.—Sales much better than anticipated are reported, though the decline in prices on farm products is tending to hold back a good many purchases. The latter effect is particularly noticeable in the sections where wheat and corn are chiefly relied upon.

SAN FRANCISCO

Although store business is now in a slight slump because of the interseason period, contracting business is very brisk. A new wage schedule that will probably be based upon a figure of $1 per hour for the standard trades will soon become effective. New freight rates on a number of commodities that represent a cut of about 20 per cent are announced for transcontinental freight shipments, but so far there are no electrical items affected. The San Francisco Industrial Exposition, opening Nov. 19 and featuring local products, is practically oversubscribed for space, and its success is assured. Dealers report increasing call for curling irons. These are becoming more popular than curling-iron heaters, although sales of the latter are also increasing in number.

Plugs and Clusters.—In conformance with the local policy of decreasing the maximum quantities necessary to secure maximum prices some plugs are now sold to dealers at 10 cents each in lots of 100 and plug clusters at 58½ cents each in lots of ten. There is a brisk demand.

Knobs and Cleats.—Prices on the split portion of knobs are quoted at a decrease of 10 per cent from previous prices, No. 5½ split being sold in barrel lots at $17.75 per 1,000 and tenpenny "Nail-it" knobs in barrel lots at $22.50 per 1,000. Two and three-wire unglazed cleats in barrel lots are selling at $20 per $1,000 or $36 per 1,000 if glazed. Local stocks are good.

Fuses.—New code non-refillable fuses are selling in standard package lots for $9.15 per 100 and 31-amp. to 60-amp. of the other type for $16.20 per 100. This marks a 10 per cent decrease on the small size and 20 per cent on all larger sizes. The demand is not very good, however, and is restricted to one or two standard sizes, other sizes being purchased only in very scattering quantities.

Metallic Flexible Conduit.—The ⅜-in. size in coil lots is selling for $8.40 per 100 feet and the ½-in. for $11.25 per 100 ft. Six-coil lots take a 10 per cent better price, with the privilege of assorting various sizes in full coils to secure the assortment. Flexible armored conductor in coil lots is selling for $57.30 per 1,000 ft., these prices being quoted generally. Local stocks are rather low.

PORTLAND—SEATTLE

In common with many other sections of the country, the Northwest, it appears, will have to face the problem of non-employment. The numbers out of work have decreased in some sections and increased in others. The situation in general is bad and there are many heads of families without employment. Almost all the larger cities are planning extensive municipal improvements during the coming winter to give work to the unemployed and thus help to relieve the situation.

Business in general seems to be holding up very well, and the slump that was predicted to follow the gains made in September and October has failed to materialize. Business volume continues to be an aggregate of many small and diversified items, no large contracts having characterized the sales of recent weeks. Conditions in the lumber industry remain good, production for the past week being only 13 per cent below normal. Building continues active.

Electrical jobbers report stocks in good shape generally, although there has been a temporary shortage in wiring-device stocks which is now rapidly being overcome. Jobbers have been buying short in these lines for some time past, and when an unusual demand came upon them a few weeks ago they were unprepared. Shipments to replenish stocks require from thirty to sixty days, most of them now coming by water, which means sixty days. Prices are becoming more stabilized in the standard lines, and although dealers are carefully guarding against overstocking, they are buying in larger quantities than heretofore. Buying is generally on a thirty-day basis at present. Activity continues in vacuum cleaners and electric ranges in Portland as a result of campaigns being conducted by the electrical dealers and the power companies.

Seattle reports much activity in lamps due to darker weather. A marked reduction in the price of "Mazda Type C" lamps was the principal price change of the week in this territory. Portland reports a drop of 3 to 4 per cent in the price of conduit during the week.

Heaters.—Air heaters have been moving well during the past few weeks, sizes ranging from 500 watts to 5,000 watts. In Tacoma 2-kw. and 3-kw. sizes are most popular.

SALT LAKE CITY—DENVER

Business prospects are still brightening slowly but surely. Electrical dealers are buying in slightly better quantities, and the outlet for overstocked jobbers is correspondingly widening. Buying for the holiday season has begun, but not with anything like the old-time volume. It looks, however, as though a great deal of hollow ware will move out to the ultimate consumer during the next two months. In the Denver jobbing area business has shown quite a brisk pick-up in the past two or three weeks. Conditions there on the whole are better than elsewhere in the Intermountain territory. The farmers have had a good year and have been able to liquidate in a satisfactory way with the banks. The copper shut-down has not been felt to so damaging a degree in Denver as in the Salt Lake region.

All jobbers report stock on electrical lines ample to meet their requirements and in many instances too heavy. Factories are making good deliveries. The jobbers' big problem just at present is how to reduce stocks in spots where there is an overload. Collections are on a better basis than they have been in two years. Nov. 15 was the biggest pay day the farmers of the Intermountain territory have had, the occasion being the distribution of several million dollars to sugar-beet growers by the sugar companies. What attitude the country banks will assume in the matter of collecting on notes is problematical. It is believed they will be as lenient as the larger banks controlling their activities will permit. If the farmers are allowed liberal extensions of time, business from now to the end of the year is sure to show marked improvement, whereas if collections are forced marked depression will follow.

Wire.—The opinion seems to be that wire is a good "buy" at present prices. A sharp stiffening is expected in the near future.

Wiring Devices.—A steady though rather limited demand has characterized the fall market. The large volume of cottage construction now in progress is consuming considerable stocks. Prices are back to a pre-war basis.

Washing Machines.—The past week has recorded an improvement in the market, with the Dolly type of washer decidedly in favor. Dealers are ordering in quantities barely sufficient to meet their current needs.

Manufacturers' Activities

Devoted to the Business Side of Manufacturing, Distribution and Sales, News from Jobbers and Foreign Fields and a Record of New Devices and Trade Literature

Sales of Woods Motors Rapidly Increasing

During the past three or four months sales of motors have increased at the rate of about 50 per cent per month, according to M. F. Fitch, sales manager, motor division, S. A. Woods Machine Company, Boston, Mass. Although this concern has only lately entered the field of motor building, it has been obliged to enlarge its manufacturing facilities almost continuously since placing its product on the market. Orders are now coming in at a rate which greatly encourages the officers of the company. Since June the working force has been increased more than 100 per cent. Mr. Fitch states that gratifying sales resulted from the company's display at the recent Boston textile show.

Hoover Preparing Advertising and Sales Drive

Plans are being prepared by the Hoover Suction Sweeper Company, North Canton, Ohio, for its annual week of intensified local advertising and dealers' sales. The date has been set for the week of Dec. 8-15. One of the events planned is the national window-display contest, attractive cash prices being awarded to those dealers designing the most attractive and effective window exhibit featuring the product of the company. It is stated that dealers in all parts of the country are arranging to stage a large number of home and store demonstrations, and the campaign, coming only two weeks before Christmas, is expected to show good results in sales.

Greenfield Tap & Die Reports Moderate Improvement

There has been a slight improvement in the business of the Greenfield Tap & Die Corporation in the last thirty to sixty days, according to a public statement of the concern, resulting in an increase in operations to about 30 per cent of capacity and the employment of about 550 men. The plants were shut down tight on July 1, 1921, and operated with only a skeleton organization for the greater part of the summer. Shipments have run about 40 per cent of the 1920 volume to date, but in per unit size they have been disappointing. Incoming orders have been somewhat less than this, but, according to Francis G. Echols, vice-president and general manager, there is at the present time a considerable improvement in this matter over the midsummer. Jobbers and retailers are reported to be running with extremely low stock, but until there are more distinct signs of revival the Greenfield concern will manufacture on an exceedingly conservative basis, inventory still being disproportionately heavy.

It is interesting to note that, though the size of the average bookings has appreciated perhaps 40 per cent from the low monthly level of the year, it is only 25 per cent of the 1920 figures. Foreign business is holding up well, running about 25 per cent of total business.

Ward Pamphlet Deals with City Delivery Waste

The biggest cost in city delivery is ignorance, according to a new pamphlet just issued by the Ward Motor Vehicle Company, Mount Vernon, N. Y. The booklet discusses the value of the electric truck in making city deliveries, as compared with gasoline truck and horse delivery.

"If business executives will get into the delivery situation again," says the pamphlet, "get the real facts and take a good square look at them they can cut their city delivery costs 20 per cent to 35 per cent, and in some cases 50 per cent. Looking at the coming ten years, with the return to normal business, normal margins of profit and keen competition, the money saved by eliminating extravagance in city delivery may make the difference between a losing and a profitable business."

The pamphlet includes discussions of horse delivery, gasoline truck delivery, the proper length of truck life, the economy of electric trucks, the value of the worm drive and other subjects.

Century Entertains St. Louis Engineering Societies

A meeting of the Associated Engineering Societies of St. Louis was held at the plant of the Century Electric Company, 1811 Pine Street, St. Louis, on Oct. 26, under the auspices of the St. Louis Section of the American Institute of Electrical Engineers. Among the speakers were J. L. Hamilton, chief engineer of the Century Electric Company; Prof. A. C. Lanier, professor of electrical engineering, Missouri State University; Hans Weitzel, designing engineer, Wagner Electric Company, and H. W. Eales, electrical engineer for the Union Electric Light & Power Company, St. Louis. Previous to the presentation of the papers the guests were taken on an inspection trip through the entire Century plant.

Allis-Chalmers Unfilled Orders Large

The unfilled orders on hand as of Sept. 30, 1921, on the books of the Allis-Chalmers Manufacturing Company, Inc., Milwaukee, Wis., aggregated $7,260,574.89, almost $2,000,000 ahead of the total sales during the three months of July, August and September. These figures were obtained from a statement of earnings issued by the company for the third quarter of 1921. Sales billed for July, according to the statement, were $2,063,242.93, for August $1,785,901.22 and for September $1,520,468.17, making a total for the quarter of $5,369,612.32.

Beardslee Issues "Ad" Series to Dealers

It is the belief of the Beardslee Chandelier Manufacturing Company, Chicago, that the average electrical contractor-dealer on account of the demands of his business can find very little time to prepare advertising matter for local papers. To offset this disadvantage the Beardslee company has for the second time prepared a series of home-lighting fixture advertisements, accompanied by electrotypes, for the use of its dealers. Recently the company sent out a "ready-made ad" circular to electrical dealers, and more than 300 took advantage of the offer, 70 per cent requesting electrotypes to go with the full series. A large percentage of the dealers used the advertisements just as they were written, showing willingness to co-operate along advertising lines and an appreciation of the value of newspaper advertisements. The results of the first series of "ads" were so good that the Beardslee company decided to prepare another series, and, according to F. L. Farmer, manager of the Denzar division of the company, these are being mailed out at the present time.

Standard Underground Rebuilding Pittsburgh Plant

The Standard Underground Cable Company, whose general offices are in the Westinghouse Building, Pittsburgh, Pa., is rebuilding its Pittsburgh plant, the pioneer plant of the industry in its line. In addition to some lesser alterations and additions to the original plant, it has under erection a new four-story-and-basement, steel frame and brick-construction building, 100 ft. x 292 ft., to provide for a general increase in the manufacture of lead-covered cable, cable accessories, etc. These additions are expected to be completed by spring of 1922.

Simplex Company Conducting Campaign in Dailies

To stimulate local demand for its "Sunbowl" heater, the Simplex Electric Heating Company, Cambridge, Mass., is conducting a somewhat unusual campaign in the daily press of Boston, Philadelphia and Chicago, nine papers with a total circulation of 2,630,000 being utilized. R. P. Ingalls, sales manager, informed a representative of the ELECTRICAL WORLD that the company is buying space in these dailies with the idea of co-operating to the utmost extent with local jobbers and dealers in establishing a closer contact with the public and in bringing home to the latter the comfort, convenience, safety and cheer of radiant heater service from the lamp socket. The campaign began early in October and will continue to Christmas.

Four dailies in Boston, three in Philadelphia and two in Chicago were selected for the publicity work required. The usual display is a 100-line "reader" advertisement twice a week and a 300-line feature advertisement once a week. Each display includes an illustration of some application of radiant heater service, the standard retail price, and pithy phrases emphasizing the value of this type of equipment at this season. Extensive dealer helps have been sent out by the company to facilitate tying in local displays of dealers with the newspaper publicity. The results have been

very satisfactory, Mr. Ingalls stated. Jobbers have enlarged their stocks and a noteworthy increase in buying by the general public is apparent, despite a season most trying from the standpoint of the unusually long-continued non-freezing weather.

American Steel & Wire Improves Plant

The American Steel & Wire Company, Worcester, Mass., contemplates an expenditure of $100,000 on its Worcester works at once to give employment to its men who would be idle otherwise. This is the local share of the $10,000,000 which the United States Steel Corporation has voted to expand in the extension of its manufacturing plants.

Jeffery-Dewitt Voluntary Bankrupt—To Reorganize

The Jeffery-Dewitt Insulator Company, Kenova, W. Va., filed a voluntary petition in bankruptcy in the United States District Court at Huntington, W. Va., on Nov. 2. The action, according to a statement given out to the trade, is entirely a friendly one and was taken to aid in the reorganization of the company on a more solid financial basis. Walter M. Dailey, formerly assistant secretary and treasurer of the company, has been appointed receiver and will carry on the business until the reorganization is completed. Over 70 per cent of the liabilities are held by A. B. Jeffery, J. A. Jeffery, M. C. Dewitt, the Jeffery-Dewitt Company, and the Champion Spark Plug Company, all of whom are interested in the company. A notice has been sent out to other creditors notifying them that there is no possibility of loss. It was also announced that during the receivership the business would be carried on as usual and that guarantees would be maintained as before. The condition of the business is good, according to officers of the company, a profit having been realized in September, while there is considerable business on the books and in sight.

New Electrical Machinery Insurance Policies Issued

Two large insurance companies have just announced that they are prepared to quote rates on electrical machinery insurance and to issue policies to indemnify against loss or damage on account of mechanical breakdown and electrical burn-out of machinery covered. The policy of the Ocean Accident & Guarantee Corporation, Ltd., of London, England, covers damage to the property of the assured and to the property of others for which the assured may be liable. It may be indorsed to cover liability for injury to employees or public or both, and may also be indorsed to cover loss of use. The second policy, issued by the Travelers' Indemnity Company, protects the assured against loss or damage sustained by him on account of mechanical breakdown and electrical burn-out of the insured machines accidentally caused. Rating information required is virtually the same in both cases, it being necessary to furnish the name of the manufacturer, the capacity, the speed, motor, kind of current generated or used, phases, various diameters, pressure in the case of steam turbine, etc.

Wadsworth Company Holds First Sales Conference

The Wadsworth Electric Manufacturing Company held a sales conference Oct. 26 and 27 to discuss sales and to assist in developing means by which the electrical industry could be informed of the use of inclosed switches for the purpose of safety. Comment was made during the meeting on the entrance safety switch for electrical homes to insure the development of good will on the part of the customer toward the power companies and to eliminate trouble and expense formerly experienced with fuse blowouts and renewals.

The industrial field was also discussed, and it was the opinion of all the representatives that the inclosed-switch idea is more widely appreciated among electrical engineers than formerly and that the use of safety switches of the inclosed type is becoming more widely understood and applied. G. R. Watson, formerly Cincinnati representative of the Crouse-Hinds Company, has been appointed general sales manager of the Wadsworth Electric Manufacturing Company and will assume his duties at once.

WADSWORTH SALES ORGANIZATION GETS TOGETHER TO DISCUSS PROMOTION OF INCLOSED SWITCH

Fort Wayne Works of General Electric to Increase Output

The meter department of the Fort Wayne (Ind.) works of the General Electric Company, now employing between 400 and 500 men four days a week, according to Walter S. Goll, assistant manager, will be put on a full-time basis at once, while the small motor department, now employing about the same number of men on the same basis, may also be put on full time in the near future. Following the decision of the officials to increase the time of the present force in these departments, the question of increasing the time in the fractional-horsepower motor departments is also being considered. This is almost the first rift in the clouds for the Fort Wayne plant of the General Electric Company, which first felt the business depression a year ago this September and which has been running with greatly depleted forces and on only a part-time basis since the first of the year.

Richardson-Phenix and Bowser Consolidate

An announcement has been made of the consolidation of the Richardson-Phenix Company and the S. F. Bowser Company. The former is well known for its development of lubricating devices and appliances for filtration and reclamation of lubricating oils, while the latter is equally prominent as a manufacturer of pumps and storage systems for oils and gasoline. The name and personnel of each company remain unchanged. Executive headquarters will be established in the new office building of the Bowser company at Fort Wayne, Ind. S. F. Bowser is president of the Bowser company. S. B. Bechtel, vice-president of that company, becomes vice-president and general manager of Richardson-Phenix, while J. William Peterson, president of the latter company, becomes vice-president of the Bowser company. L. E. Strothman, vice-president and general manager of the Richardson-Phenix Company and vice-president-elect of the A. S. M. E., has been in ill health for some time and is to have an extended leave of absence.

Charles Cory & Son, Inc., 183-7 Varick Street, New York City, have secured the American sales rights of the "Cory-Record" ohmmeter, manufactured by the Record Electrical Company, Ltd., Altringham, England.

The Mohawk Electrical Supply Company, Syracuse, N. Y., has discontinued its retail business and moved from its old location at 325 South Warren Street to the Great Northern Warehouse Building, 348-360 West Fayette Street. At the present time the company is doing a wholesale business only.

Foreign Trade Notes

THE CANADIAN AUSTIN MACHINERY, LTD., Woodstock, Ont., incorporated under the laws of Canada, will act as manufacturer and distributor in Canada of the complete line of products manufactured by the Austin Machinery Corporation of Chicago.

HYDRO-ELECTRIC DEVELOPMENT ON THE JORDAN, PALESTINE.—Concessions have been granted by the Palestine government and the Colonial Office to a Mr. Rutenberg to develop the water power of the Jordan, the Yarmuk and other rivers in Palestine to generate electricity, which will be distributed throughout the country.

DEVELOPMENT OF WATER POWER IN ROUMANIA PROPOSED.—A law recently drafted provides for the development of water power in Roumania. The law has the approval of the appropriate committees of both houses of the Legislature and is expected to be enacted practically as drafted. As the coal resources of the country are poor, it is expected, that the water power will probably be developed extensively.

HYDRO-ELECTRIC DEVELOPMENT AND RAILWAY ELECTRIFICATION IN SWITZERLAND. — The development of water power, in spite of the present high cost of installation, according to a commercial and industrial handbook on Switzerland issued by the Bureau of Foreign and Domestic Commerce, Department of Commerce, is being pushed as never before in Switzerland. The most important part of this work is being carried on by the government in connection with the electrification of the federal railways, and a number of important installations are now under construction or contract. The first important stage of the general electrification program was nearing completion at the end of 1920. For furnishing the electrical energy two large installations are being made. The first is the Ritom works on the south side of the Gotthard tunnel in the Canton Tessin, which utilizes the water of the Ritom Lake. In this plant four high-pressure turbines of 12,000 hp. each have been installed, with provision for two more turbines of the same rating, bringing the total capacity to 72,000 hp. The other power plant for the Gotthard line, the Amsteg installation, is in the Canton of Uri on the northern side of the tunnel and utilizes the water of the River Reuss. This plant is now under construction and is designed to have an initial installation of 60,000 hp., to be increased later to 90,000 hp. The program of electrification on which the government is now launched forsees the electrification of practically the entire federal system of some 1,750 miles within a period of twenty years, and the total cost of the work is estimated at more than a billion francs. The average amount of power required for the entire system is estimated at 200,000 hp., with a maximum of 600,00 hp. Considerable progress has been made on the electrification of the so-called secondary lines, which are for the most part privately owned, but further development is being impeded by the lack of financial resources, which the federal railways are better able to command. One of the articles which the railway authorities have had the greatest difficulty in obtaining in satisfactory quality and quantity for electrification purposes is heavy porcelain insulators for high-tension use. Insulators of the kind specified by the railway engineers are not obtainable in Switzerland. Switches for outdoor use in high-tension transmission lines along the right-of-way are also in demand, as difficulty has been experienced in obtaining proper apparatus of this kind from the domestic market. Inquiries for information in connection with this work should be made to the management at Berne (Direction des Chemins de Fer Federaux).

Foreign Trade Opportunities

EQUIPMENT FOR ELECTRIC PLANT AT BUENOS AIRES.—Bids will be received by the Board of Sanitary Works of the Nation, Buenos Aires, Argentina, until Jan. 19, 1922, according to *Electrical Industries*, for furnishing and erecting a new electric generating station, previous bids having been asked for in 1919, 1920 and June 3, 1921. The equipment will include three four-cycle Diesel engines of 375 hp. each, adapted to run on crude petroleum and three three-phase alternators, each of 250 kw., 2200 volts between phases, 50 cycles.

ELECTRICAL EQUIPMENT FOR MUNICIPAL PLANT, MELBOURNE. — The City Council of Melbourne, Australia, according to *Electrical Industries*, will receive tenders until Feb. 20, 1922, for a 2,000 kw. rotary converter and transforming accessories, and also a 6,600 volt, 50 cycle, three-phase switchgear.

TURBO-ALTERNATOR AND CONVERTERS FOR SYDNEY.—Tenders will be received by the Municipal Council of Sydney, New South Wales, Australia, until April 24, 1922, according to *Electrical Industries*, for furnishing and erecting a 10,000 kw. turbo-alternator and two 2,000 kw. rotary converters.

New Apparatus and Publications

THE BLACK & DECKER MANUFACTURING COMPANY, Chicago, has placed on the market a light-weight, ¼-in portable electric drill with pistol grip.

RECORDER.—The Yarnall Waring Company, Chestnut Hill, Philadelphia, is distributing a leaflet describing the "WR CO2" self-contained recorder recently developed by the company.

ELECTRIC CLOCK.—An electric clock, which requires no winding, for use in offices, homes, motor cars, etc., has recently been placed on the market by the Keith-Landis Corporation, 332 South La Salle Street, Chicago.

ELECTRIC GRINDER. — The Black & Decker Manufacturing Company, Baltimore, Md., has recently brought out a new grinder known as an 8-in. electric bench grinder.

ILLUMINATING GLASSWARE. — The Beardslee Chandelier Manufacturing Company, 216-220 South Jefferson Street, Chicago, has issued a new net price list on its illuminating glassware carried in stock, which is illustrated in catalog G-S-1.

TRANSFORMERS.—"Power Transformers" is the title of bulletin No. 1,108 issued by the Allis-Chalmers Manufacturing Company, Milwaukee, covering its different types of transformers.

ELECTRIC IRON. — The Tommy Iron Manufacturing Company, 1900 Oliver street, St. Louis, has placed on the market a new electric iron, known as the "Tommy iron," designed for use of milliners, dressmakers, manufacturers and for domestic purposes.

PULL CHAINS. — The Bryant Electric Company, Bridgeport, Conn., has developed a line of decorative pull chains to match stands and shades of table and floor lamps.

FLUSH PLATES.—Several types of flush plates with a new flinish, known as "Perma," are being produced by the Bryant Electric Company, Bridgeport, Conn.

HOSPITAL CONTROL SWITCH. — A manually operated toggle hospital signal-system control switch has recently been placed on the market by the Bryant Electric Company, Bridgeport, Conn.

BABBITT METAL.—The Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., is distributing folder No. 4,474, covering the Westinghouse lead-base babbitt metal.

BALL BEARINGS.— "Good Fractional Horsepower Motors Made Better" is the title of a booklet issued by the Norma Company of America, Anable Avenue, Long Island City, N. Y., describing the "Norma" precision ball bearings.

CEILING AND WALL OUTLETS.—Bulletin No. 17-7, issued by Harvey Hubbell, Inc., Bridgeport, Conn., describes its "Elexit" devices.

LIGHTING FIXTURES.—The St. Louis Brass Manufacturing Company, St. Louis, has issued catalog BC-11, describing its different types of residence lighting fixtures.

VALVES, GOVERNORS AND REGULATORS.—The Atlas Valve Company, 282 South Street, Newark, N. J., has issued junior catalog No. 21, describing its "Atlas," "Ideal" and "Victor" reducing valves, pump governors, pressure regulators, etc.

AUTOMATIC ELECTRIC STOVE.—The William Campbell Company, Detroit, is distributing a circular describing its "automatic rapid electric cook stove," and also a leaflet covering equipment and list of parts for the electric stove.

BALL BEARINGS.—The November issue of the *Dragon*, issued by the Fafnir Bearing Company, New Britain, Conn., contains a description of a testing machine for demonstrating the relative power consumption of ball bearings and plain bearings.

ELECTRIC MOTORS.—The Metropolitan-Vickers Electrical Company, Ltd., Trafford Park, Manchester, Eng., has issued special publication No. 7855/2, dealing with the choice of motors for industrial work.

LIGHTING DEVICES. — Bulletin No. 17-5, issued by Harvey Hubbell, Inc., Bridgeport, Conn., describes several new devices added to its products, including interchangeable "Knostrain" plug caps, polarized cord connector, round flush receptacle and separate red lamp for Hubbell "Signalite."

ILLUMINATION.—"Eye Comfort" is the title of a folder inclosing leaflets being distributed by the National X-Ray Reflector Company, 235 West Jackson Boulevard, Chicago, covering its reflectors for show-window lighting, showcase lighting, indirect lighting and crystal fixtures for theater lighting.

SWITCHES. — Harvey Hubbell, Inc., Bridgeport, Conn., is distributing a four-page leaflet describing its toggle flush switches.

New Companies

THE ATLANTIC ELECTRIC LAMP COMPANY, Danvers, Mass., has been organized by V. A. and William W. Trotter and John H. O'Neil, all of Danvers. The company is capitalized at $15,000 and proposes to manufacture incandescent lamps.

THE THOMAS PRODUCTS COMPANY, Seattle, Wash., has been organized with a capital stock of $50,000 to manufacture electrical and mechanical fittings, fixtures, devices and searchlights. Baushman, Oldham, Bullitt & Eggerman, 1408 Hoge Building, represent the company.

THE CLEVELAND (VA.) LIGHT & POWER COMPANY has been incorporated with a capital stock of $10,000. The officers are S. C. Couch, president, and D. E. Campbell, secretary.

THE STANDARD ELECTRIC & RADIO CORPORATION, Wilkinsburg, Pa., has been incorporated with a capital of $5,000 to manufacture electrical equipment. T. K. Lewis, Wilkinsburg, is treasurer.

THE AUTOMOTIVE ELECTRIC SALES COMPANY, 2637 South Michigan Avenue, Chicago, Ill., has been incorporated by Philip and Benjamin Siegal. The company is capitalized at $50,000 and proposes to manufacture and deal in electrical devices, etc.

THE FRANKLIN LIGHT COMPANY, 127 North Dearborn Street, Chicago, Ill., has been organized with a capital stock of $10,000 to manufacture and deal in electrical fixtures, supplies, etc. The incorporators are Harvey Adams, Benjamin H. Kanue and G. Litka. Weil & Chalkin, room 1208, 137 North Dearborn Street, represent the company.

THE BUCKEYE ELECTRIC LIGHT COMPANY, Lima, Ohio, has been incorporated with a capital stock of $10,000 by A. E. Henry, H. V. Swinehart, G. M. Kindell and others.

THE H. E. GELHART & COMPANY, 2030 Seventh Avenue, Rock Island, Ill., has been chartered with a capital stock of $50,000 to manufacture electrical supplies and fixtures. The incorporators are H. E. and C. Gelhart and Willard E. Hartman.

THE COLONIAL LAMPS & FIXTURE WORKS, 5634 Lake Park Avenue, Chicago, Ill., has been chartered with a capital of $50,000 to manufacture and deal in electric lamps, fixtures, etc. The incorporators are Leon Hornstein, Eugene H. Joseph and Albert Hornstein.

THE ECONOMY ELECTRICAL SUPPLY COMPANY, Brooklyn, N. Y., has been incorporated by C. A. Carlson, C. A. Loscalzo and C. Kearney. The company is capitalized at $10,000 and proposes to manufacture electrical equipment. I. Konigsberg, 114 Liberty Street, represents the company.

THE UNITY ELECTRIC COMPANY, West Unity, Ohio, has been organized with a capital of $100,000 by Charles F. Chapman, Frank M. Coburn and others.

THE HAVERHILL-LAUREL ELECTRIC COMPANY, Laurel, Iowa, has been organized with a capital stock of $50,000. Peter Neuroth, Haverhill, Iowa, is president.

Record of Electrical Patents

Notes on United States Patents

(Issued Oct. 18, 1921.)

1,393,806. AUTOMATIC TELEPHONE SYSTEM; Talbot G. Martin, Chicago, Ill. App. filed Oct. 13, 1917. Private automatic exchange.

1,393,859. SYNCHRONIZER FOR TALKING MOTION PICTURES; Kenneth M. Walley, Chicago, Ill. App. filed Feb. 17, 1917. For maintaining synchronism between phonograph and motion-picture machine.

1,393,878. METHOD OF BUILDING COMMUTATORS; Vincent G. Apple, Dayton, Ohio. App. filed Aug. 6, 1919. Bars inserted in grooves of ring.

1,393,888. CIGAR LIGHTER; Francis B. Farnsworth, Montreal, Que., Can. App. filed Sept. 30, 1919. For use in automobiles.

1,393,921. ELECTRICAL UNCAPPING KNIFE; Henry C. Swann, Spokane, Wash. App. filed May 11, 1920. Electrically heated.

1,393,939. OVERHEAD TROLLEY OR COLLECTOR FOR ELECTRIC TRAMWAY AND RAILWAY VEHICLES; Thomas Blaney and David Williams, Walton, Liverpool, England. App. filed June 6, 1921. Means for absorbing sudden jar.

1,393,945. ELECTROLIER; Le Roy G. Clark, Detroit, Mich. App. filed Nov. 5, 1919. Repairs made without disturbing wiring.

1,393,946. TELEPHONE-EXCHANGE SYSTEM; Henry P. Clausen, Mount Vernon, N. Y. App. filed March 21, 1917. To attract operator's attention when called subscriber answers.

1,394,020. INSULATOR CHANGER; Tomlinson F. Johnson, Jr., Atlanta, Ga. App. filed March 16, 1918. Holds live line while changing insulator.

1,394,026. RADIO SYSTEM; Lloyd M. Knoll, Philadelphia, Pa. App. filed April 2, 1920. Minimum of interference.

1,394,044. WATER-COOLED TRANSFORMER; Howard O. Stephens, Pittsfield, Mass. App filed March 25, 1919. For transformers used on welding machines.

1,394,055. RESISTANCE-UNIT TERMINAL; William C. White, Schenectady, N. Y. App. filed March 15, 1920. Terminals dipped in carbonizable material.

1,394,056. SIGNALING SYSTEM; William C. White, Schenectady, N. Y. App. filed July 3, 1920. Energy from alternating current of commercial low frequency.

1,394,057. ELECTRIC COUPLING DEVICE; Harry F. Woernley, Pittsburgh, Pa. App. filed May 4, 1918. For connecting electric train-line circuits.

1,394,062. MEANS FOR AND METHOD OF REDUCING CROSS-TALK IN FOUR-WIRE CIRCUITS; Otto B. Blackwell, Garden City, N. Y. App. filed May 20, 1918. Repeater system.

1,394,064. PRINTING-PRESS ATTACHMENT; William H. Chapman, Portland, Me. App. filed July 27, 1921. For drying the ink.

1,394,090. VALVE OF WIRELESS TRANSMISSION SYSTEMS; Cassius E. Hiatt and William J. Davis, London, England. App. filed May 19, 1919. Thermionic.

1,394,101. ELECTRIC HANDLAMP; Bert A. Little, Tulsa, Okla. App. filed Sept. 8, 1919. Tubular type.

1,394,121. ELECTRICAL APPARATUS; Ivanhoe H. Sclater, Pittsfield, Mass. App. filed June 12, 1919. Transformer-core construction.

1,394,143. X-RAY APPARATUS; William D. Coolidge, Schenectady, N. Y. App. filed Oct. 24, 1919. Tank completely filled with oil.

1,394,144. INCANDESCENT-CATHODE APPARATUS; William D. Coolidge, Schenectady, N. Y. App. filed Oct. 24, 1919. Operated in oil.

1,394,145. THERMIONIC DISCHARGE APPARATUS; William D. Coolidge, Schenectady, N. Y. App. filed Nov. 15, 1919. For continuous operation with high energy input.

1,394,147. ELECTROLYTIC REFINING OF METALS; Frederick D. Crane, Montclair, N. J. App. filed Dec. 18, 1920.

1,394,171. ELECTRIC NEEDLE; Mary E. Hall Chicago, Ill. App. filed May 2, 1921. For removing superfluous hair.

1,394,187. RESISTOR; Elmer E. F. Creighton, Schenectady, N. Y. App. filed March 15, 1920. Of unusual stability.

1,394,189. REPEATER-CONTROLLING SYSTEM FOR FOUR-WIRE CIRCUITS; Charles S. Demarest, New York, N. Y. App. filed Feb. 24, 1919. For controlling connection of telephone repeaters.

1,394,190. TESTING SYSTEM FOR FOUR-WIRE CIRCUITS; Charles S. Demarest, Ridgewood, N. J. App. filed July 24, 1920. For controlling connection of telephone repeaters.

1,394,211. APPARATUS FOR DISCHARGING STATIC CHARGES; John H. Morgan, Holyoke, Mass. App. filed April 21, 1917. Especially from paper.

1,394,220. BAKING OVEN; William Roberts, Winnipeg, Man., Can. App. filed Jan. 4, 1919. Low consumption, even heat and easy control.

1,394,279. SEPARATOR PLATE FOR STORAGE BATTERIES; Frank A. Coleman and Joseph J. Hoffman, Denver, Col. App. filed March 12, 1921. Non-short-circuiting.

1,394,325. FREQUENCY CHANGER; Friedrich W. Meyer, Milwaukee, Wis. App. filed Nov. 15, 1917. Simple static means.

1,394,439. CODE-TRANSFORMING APPARATUS FOR TELEGRAPH SYSTEMS; Donald Murray, London, England. App. filed Jan. 20, 1919. Printing-telegraph system.

1,394,450. BREAD TOASTER; Charles P. Strite, Mineapolis, Minn. App. filed June 22, 1920. Automatically cut off after bread has been toasted.

1,394,462. PROCESS AND APPARATUS FOR REFINING LIQUID MIXTURES; Seth F. Alden, San Francisco, Cal. App. filed Dec. 23, 1916. To break up liquid mixtures or emulsion.

1,394,466. STORAGE-BATTERY SEPARATOR AND METHOD OF PRODUCING SAME; Harry L. Boyer, Trenton, N. J. App. filed Sept. 29, 1919. Composed of porous and non-porous portions.

1,394,503. DENTAL X-RAY-FILM PACKET; Raymond R. Taylor, Rochester, N. Y. App. filed Jan. 8, 1919. May be used in patient's mouth.

1,394,507. TROLLEY-HARP CARRIER; Charles J. Dorrance, Chicago, Ill. App. filed April 21, 1920. Shock-absorbing device.

(Issued Oct. 25, 1921)

1,394,518. ELECTRIC HEATING UNIT; Charles C. Abbott, Pittsfield, Mass. App. filed Oct. 30, 1919. Conductors inclosed in metallic sheath.

1,394,528. ELECTRIC METER CONSTRUCTION; Donald J. Angus, Indianapolis, Ind. App. filed May 20, 1918. The metering parts and the record and record-making parts are in separate compartments.

1,394,535. ELECTRIC MOTOR; Edward Bretch, St. Louis, Mo. App. filed July 12, 1920. Motor-starting arrangement.

1,394,555. ELECTRICAL TRANSFORMER; Harry L. Idem, Springfield, Ill. App. filed Oct. 6, 1920. For radio use.

1,394,560. APPARATUS FOR TRANSMITTING RADIANT ENERGY; Frederick A. Kolster, Washington, D. C. App. filed Nov. 27, 1916. Telegraphy, telephony or any other signaling or control purposes.

1,394,563. TELEPHONE INSTRUMENT; Hubert A. Leise, Meriden, Conn. App. filed May 27, 1920. Vented diaphragm chamber.

1,394,565. ELECTRIC SIGN; John E. Long, Hot Springs, Mont. App. filed Aug. 24, 1917. Flashing type.

1,394,569. INCREASING THE EFFICIENCY OF X-RAY TUBES; William Meyer, Chicago, Ill. App. filed Aug. 19, 1918.

1,394,575. SUSPENSION MEANS FOR ELECTRIC LIGHTING FIXTURES; Ira L. Park, Washington, D. C. App. filed Jan. 28, 1920. Wire concealed in supporting chain.

1,394,600. WIRELESS-TELEGRAPH RECEIVER; George M. Wright, London, England. App. filed June 8, 1916. Noises due to atmospherics reduced.

1,394,601. THERMIONIC DEVICE; George M. Wright, London, England. App. filed May 1, 1918. Any desired magnification.

1,394,604. METHOD OF MANUFACTURING RAIL BONDS; William P. Bovard, Mansfield, Pa. App. filed Feb. 10, 1921.

1,394,642. ELECTRIC SIGNALING SYSTEM; Ralph L. Quass, Hawthorne, N. J. App. filed Nov. 12, 1919. Machine-switching telephone.

1,394,647. TIME-INDICATING SYSTEM; Alfred L. Sohm, Chicago, Ill. App. filed Feb. 24, 1920. Electromagnetically wound master clock.

Construction News

Projects, Plans, Bids and Contracts, Contemplated or Under Way

New England States

GRAY, ME.—The Cumberland County Power & Light Company, Portland, is considering the erection of a transmission line from Gray Corner to East Gray.

HOLYOKE, MASS.—The Hegy Company, Inc., South Main Street, has had plans prepared for the construction of a one-story power house.

Middle Atlantic States

BOLIVAR, N. Y.—Plans are under consideration by the local electric light committee to secure electricity for domestic and power purposes in Bolivar. The project includes the erection of an electric transmission line. H. L. Hulett is chairman of the light committee.

BROOKLYN, N. Y.—Plans are under consideration by the Brooklyn Edison Company for the construction of a power plant, 80 ft. x 130 ft., on Sixty-sixth Street, to cost about $120,000. G. L. Knight, 360 Pearl Street, Brooklyn, is engineer.

BROOKLYN, N. Y.—Plans have been prepared by the New York Dock Company, 41 Whitehall Street, New York City, for the construction of a one-story power house at Furman and Montague Streets, Brooklyn.

BUFFALO, N. Y.—T. Kennard Thompson and Peter A. Porter have applied to the New York State Water Power Commission, Albany, for preliminary permit for hydro-electric development at Foster Flats on the lower Niagara.

CLINTON, N. Y.—The Madison Power Company has petitioned the Public Service Commission for permission to erect an electric transmission line from the substation of the Utica Gas & Electric Company at Clinton to Hamilton, a distance of 20 miles.

NEW YORK, N. Y.—Arrangements are being made by the Electric Bond & Share Company for an increase in its capital stock from $20,000,000 to $25,000,000, the proceeds to be used for extensions to its plants and system.

NEW YORK, N. Y.—The Sheffield Farms Company, Inc., 524 West Fifty-seventh Street, has had plans prepared for the construction of a three-story ice and refrigerating plant on Webster Avenue, to cost about $125,000. Frank A. Rooke, 15 East Fortieth Street, is architect.

OLEAN, N. Y.—The Bradford Electric Railway Company and the Olean, Bradford & Salamanca Railway Company have been consolidated under the name of the latter company, with a capital stock of $3,808,000. Improvements and extensions to plant and system are under consideration. J. B. Mayer and others are incorporators.

OSSINING, N. Y.—Plans are being prepared by C. F. Rattigan, superintendent of State Prisons, for the installation of a new underground feeder system, pumping plant and auxiliary equipment at Sing Sing Prison.

SPENCERPORT, N. Y.—A company is being organized in the town of Parma for the purpose of furnishing electricity to residents on Ridge Road and as far north as Peck Road. Electrical energy will be purchased from the village of Spencerport.

CAMDEN, N. J.—The Harbor Engineer, Room 11, City Hall, Camden, it is reported, is receiving bids for a 3-ton electric traveling crane of locomotive type, electric tractor with eight trailer trucks, and two portable electric winches, to be installed at the city harbor, Spruce Street pier. George W. Bradley is chairman of harbor committee.

LAKE HOPATCONG—N. J.—The ice plant, including power house, of Brady Brothers, was recently destroyed by fire, causing a loss of about $150,000.

NEWARK, N. J.—Arrangements have been made by the Public Service Corpora-

tion, Public Service Terminal Building, for an issue of $2,000,000 in stock, the proceeds to be used for improvements and extensions.

VENTNOR CITY, N. J.—A new contract has been entered into with the Atlantic City (N. J.) Electric Company, by the City Council, under which a new street-lighting system will be installed.

BENTLEYVILLE, PA.—A contract with the West Penn Power Company, Pittsburgh, has been approved by the Borough Council for the installation of a new street-lighting system in Bentleyville.

FAYETTEVILLE, PA.—The Fayetteville Electric Company and the Greene Township Electric Company have arranged a territorial agreement and contemplate the extension of their transmission lines to neighboring sections.

PHILADELPHIA, PA. — Improvements and extensions to the pumping plant for the waterworks department at Lardner's Point are under consideration by the Water Bureau.

PITTSBURGH, PA.—Plans are under consideration for the installation of a burglar alarm and police signalling system in Pittsburgh. Robert J. Alderdice is director of public safety.

BALTIMORE, MD.—One of the plants of the Maryland Brick Company, Maryland Trust Building, including power house, etc., was recently destroyed by fire, causing a loss of about $100,000. Warren Griffiss is manager.

BETTERTON, MD.—Plans are being prepared for the construction of a two-story power house, 60 ft. x 150 ft., for the Hotel Colonial. Clark & Dudnick, Drexel Building, Philadelphia, are architects.

CUMBERLAND, MD.—Thomas B. Finan of Cumberland, and Townsend, Scott & Son, 209 East Fayette Street, Baltimore, it is reported, have purchased the systems of the Cumberland Electric Railway and the Edison Electric Illuminating Company subject to the approval of the Public Service Commission of Maryland. The purchasers are planning to organize a new company and consolidate the railway and power and lighting plants under one management. Extensions and improvements, it is understood, will be made to both systems.

CUMBERLAND, MD.—The Jamison Coal & Coke Company is considering the installation of electrical equipment for operation of its Jamison Mine No. 9. Electrical energy will be furnished by the Monongahela Power & Railway Company.

HAVRE DE GRACE, MD.—Plans are under consideration by the Susquehanna Power Company for the construction of a large dam above Conowingo Bridge on the Susquehanna. Extensive charter rights in Maryland and Virginia have been obtained. The company, it is understood, proposes to build another dam further down the river, and ultimately a third a short distance above Port Deposit. The power developed will be furnished to towns in Pennsylvania and Delaware. Francis T. Homer, 40 Wall Street, New York City, is reported interested.

AMHERST, VA.—The Amherst Light & Power Company, recently organized, is planning to install an electric lighting system in Amherst. W. A. Baldock is president.

North Central States

BLOOMINGTON, MD.—The installation of a new ornamental lighting system in Bloomington is under consideration by the City Council.

BLOUNTSVILLE, IND.—Kilmer Brothers, operators of an electrical distribution system in Blountsville, have requested the Indiana Public Service Commission for permission to discontinue the plant. Should the Kilmer plant be closed, electrical energy will be obtained from a nearby transmission line.

UNION CITY, IND. — The Union City Electric Company has filed notice of increase in its capital stock from $50,000 to $100,000.

CHAMPAIGN, ILL.—Plans are under consideration by the City Council for the installation of a lighting system in the University district, to cost about $82,000. A total of 540 lamps will be required.

CRYSTAL LAKE, ILL.—Negotiations are under way between the residents of Crystal Lake and the Rockland Lighting Company of Suffern to supply electricity for lighting in Crystal Lake.

DODGEVILLE, WIS. — The Wisconsin Light & Power Company, Madison, is planning the construction of a substation in Dodgeville.

NEENAH, WIS.—The Valley Paper Mills Company, recently incorporated with a capital stock of $1,000,000, it is reported, is planning the construction and equipment of a plant, to cost about $800,000. The main two-story and three-story mill will be about 80 ft. x 600 ft., with separate hydro-electric power plant with steam auxiliary. A filtration will also be built. Contracts, it is understood, will be awarded about Dec. 1. E. A. Wettengel, Appleton, is architect. George W. Burnside, Neenah, is secretary and treasurer.

OSHKOSH, WIS. — The Council ha adopted revised plans and specifications fo the installation of an ornamental lighting system in Oshkosh. Bids, it is understood, will be advertised for immediately.

WAUTOMA, WIS. — Dahlke, Giese & Wedkl are having plans prepared for the construction of a hydro-electric plant at White River. The project includes a dam, pipe line, etc. Jacobson Engineering Company, 533 Metropolitan Bank Building, Minneapolis, Minn., is engineer.

WHITEWATER, WIS.—Plans are being prepared for the construction of a one-story heating and power plant, 60 ft. x 150 ft., at the State Normal School at Whitewater. W. Kittle, Capitol Building, Madison, is secretary of the Board of Normal Regents. A. Peabody, State Capitol, is architect.

BRONSON, MINN.—The construction of a power plant in Bronson is under consideration. E. F. Behrendt, Foley, is interested.

ST. PAUL, MINN.—Under a reorganization scheme the plants of the General Utilities Company of St. Paul, at Devils Lake, Carrington, Enderlin, New Rockford, Oaks and Sheldon have been purchased by Edwin White of Gates, White & Company, St. Paul, for the stockholders and will be operated by Savage & White, St. Paul. The new owners, it is understood, contemplate improvements, including extension of electric service to the lake from St. Paul.

JASPER, MO.—The local electric light plant has been purchased by W. N. Vaughan, W. L. Collier and W. E. Vaughan. A company known as the Jasper Electric Light Company has been organized to operate the plant. The installation of new equipment, including oil engines, is under consideration. W. L. Collier is manager.

KANSAS CITY, MO.—The Kansas City Power & Light Company has been authorized to issue $2,000,000 in bonds, part of the proceeds to be used for improvements and extensions.

CASTLEWOOD, S. D.—The City Council has been authorized to purchase the electric lighting system owned by the Castlewood Telephone Company. The telephone company, it is understood, will make necessary improvements preliminary to the plant being taken over by the city.

Southern States

ASHEVILLE, N. C.—The Council is considering plans for extensions to the street lighting system.

GOLDSBORO, N. C.—Plans have been prepared by the Building Commission of the State Hospital for the Insane, Goldsboro, for the construction of a new power house and ice plant, to cost about $75,000. Nathan O'Berry is chairman.

GREENSBORO, N. C.—The installation of a new street-lighting system is under consideration by the Council.

MOUNTAIN CREEK, ALA.—The Alabama Power Company, Birmingham, is planning to erect an electric transmission line over a distance of 6 miles, to provide lighting service for the buildings and campus at the Alabama Old Soldiers' Home at Mountain Creek. Spur lines will be extended to Marbury, Graphite Mines, Verbena and Mountain Creek.

SAN MARCOS, TEX.—A committee has been appointed to investigate the matter of installing an ornamental lighting system in San Marcos from the Missouri, Kansas & Texas Railway station to the Southwest Texas State Normal College.

SLATON, TEX.—The Slaton Light & Power Company is reported to be considering extensions to its plant.

Pacific and Mountain States

BREMERTON, WASH.—The Council is considering an issue of $250,000 in bonds to establish a municipal electric lighting plant.

SEATTLE, WASH.—A report recommending extensions to the city lighting system during the next two years, to cost $1,500,000, has been submitted to the City Council by J. D. Ross, superintendent of lighting. The plans include tie lines at Spokane Street, to cost $100,000, and a like amount for insulator and switch changes; changes to transformers, $30,000; underground wiring, $500,000; Spokane Street substation, $183,000; Seventh Avenue substation, $72,000; Ballard substation, $48,000; and $15,000 for Hillman, West Seattle and Fremont substations.

CANYON CITY, ORE—The town authorities are considering the installation of a light and power system or the purchase of the local equipment of the Consolidated Electric Light Company, John Day, Ore.

McMINNVILLE, ORE.—Application has been filed with the State Engineer for a permit to construct a reservoir at the headwaters of the Nestucca River for the storage of 6,000 acre-ft. of water and to appropriate 35 sec.-ft. of water through a pipe line and tunnel, 5 miles long, for the development of 5,807 hp. under a head of 1,460 ft., for municipal purposes. The cost of the project is estimated at $350,000.

OREGON CITY, ORE.—E. C. Latourette, Oregon City, has applied to the state engineer for permission to appropriate 5 sec.-ft. of water from a small stream tributary to the Williamette River for light and power purposes in East Canby Gardens.

YAMHILL, ORE.—The city authorities are considering issuing $10,000 in bonds for the purchase or construction of an electric light and power system.

FAIRFIELD, CAL.—The installation of an electrolier system on a portion of Texas Street, to cost about $10,000, is under consideration.

FILLMORE, CAL.—The City Trustees are considering improvements to the street-lighting system in Fillmore.

FRESNO, CAL.—The San Joaquin Light & Power Corporation has applied to the State Water Commission for water rights on the south fork of the Merced River and to create an artificial lake at Wawona. The project involves the construction of a large dam and four power houses. R. C. Starr, Fresno, is engineer.

LOS ANGELES, CAL.—The Southern California Edison Company has been awarded contract for a lighting system in the Jefferson Lighting District.

QUINCY, CAL. — T. Gansner has purchased the plant of the Quincy Light & Power Company.

SAN FRANCISCO, CAL.—The Mokelumne River Power Company, 502 Flatiron Building, has applied to the State Water Commission for permission to divert 500 sec.-ft. direct and 51,000 acre-ft. per annum for storage from the Mokelumne River for power purposes. The amount of power to be developed will be about 40,000 hp. The diversion works will consist of canal, tunnel and a flume about 21 miles long. The cost is estimated at $6,000,000.

BOISE, IDAHO.—The Murtaigh Irrigation District has filed application with the State Department of Reclamation to appropriate 1,000 sec.-ft. of water from the Snake River for power purposes. The project includes the construction of a power plant and a pumping plant, to cost about $494,500.

BONNERS FERRY, IDAHO.—The purchase of equipment, including generator, switchboard and transmission line, in connection with the proposed power plant at Moyie Springs power site, is under consideration. H. H. Hughes is manager of the city electric light and water system.

LAVA HOT SPRINGS, IDAHO.—The village authorities have applied to the State Reclamation Department for permission to build a hydro-electric light and power plant and dam at Beaver Falls on the Portneuf River. The cost is estimated at about $30,000.

Canada

YARMOUTH, N. S.—The plant of the Yarmouth Light & Power Company, at Carleton, it is reported, was recently damaged by fire.